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A MECHANICAL PREDICTER

BY ALFRED C. PICKELLS.

THE book of tide tables, which is issued each year by the coast and geodetic survey has always been based upon mathematical predictions. These predictions are founded upon averages obtained from gages which have recorded the time of high and low tide at about 70 of the principal ports of the world for a score or more of years back.

Originally the predictions were made by a force of mathematicians, and since such a system always gave rise to the possibility of personal error, it has always been the desire of scientists that such computations be made by machinery and thus gain nearly absolute accuracy.

This year the desire will be realized, for within the past year the machine to accomplish such results has been completed and its test of eight months has proven satisfactory. It has come to within a few per cent of accuracy, winning over its human competitors by at least 15 per cent, and not only turning out the time of high and low tide and the depth, but also tracing a curved line on paper which graphically illustrates the gradual rise and fall and the peculiarities incident to any one locality.

It was this possible difference in the figures which suggested to Lord Kelvin, in 1874, the means to eliminate the personal error by constructing a machine which would make the computations. The Kelvin machine predicted the time of high and low water only. This was too limited for modern use, for, in the rapid movement of present-day maritime affairs tidal information must contain much more than the mere time of high and low water to be of benefit. The principle upon which this machine was constructed proved, however, to be the foundation for the survey's new machine.

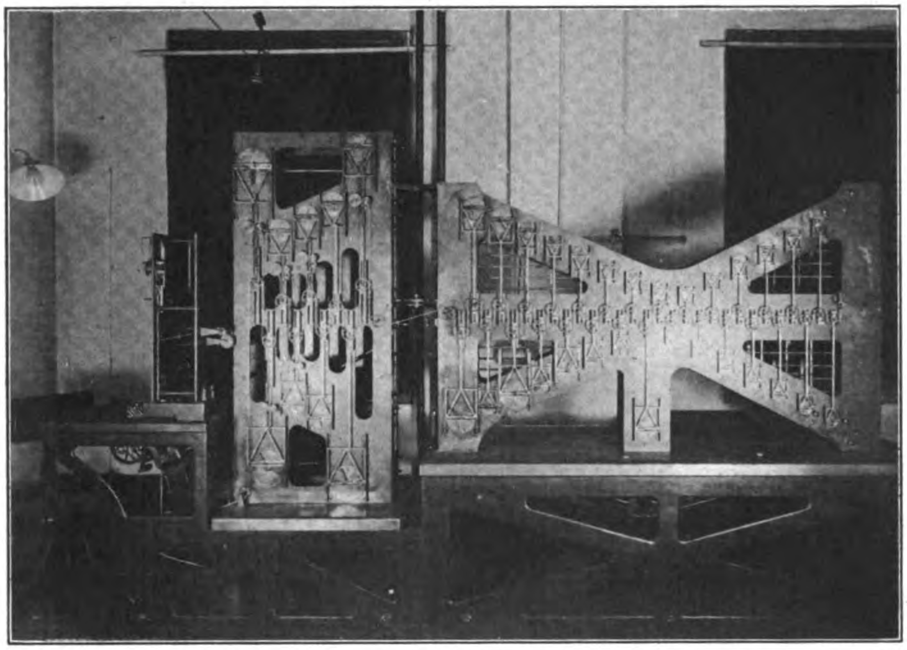
The new predicting machine was completed during February, 1911, after 14 years of experiment. The next book of predictions, soon to be issued for the coming year, will contain tables for the 70 principal ports of the world, the first to be turned out since the machine underwent its severe test for accuracy.

To gain these results the machine is composed of nearly 300 wheels and pulleys grouped into 37 sets of gears. Each of these gears represents an influence affecting the tides, including the action of the sun, the moon, various other planets, and local conditions.

For each of these conditions there has been an average made based on a number of years of observation. When, therefore, predictions are to be made for any locality the gears are set to correspond with these averages.

One operator only is necessary to

TIDE INDICATOR AT FORT HAMILTON, N. Y.



TIDE PREDICTING MACHINE, SIDE VIEW, SHOWING GEARS WHICH REPRESENT THE PLANETARY INFLUENCES

turn out a year's predictions in from seven to eight hours. By simply turning a crank the gears will influence the indicators on the dials, thus marking the time of high and low water for each successive 12 hours during the year. Another dial will record the depth of water at each rise and fall of the tide, while, at the same time, a set of pens will trace the gradual rise and fall on time-graduated paper and indicate, as a check on the direct reading, the exact moment of high and low water. The curve representing this rise and fall of a year's tides will fill a strip of paper 380 ft. long.

Society of Naval Architects and Marine Engineers

The nineteenth annual meeting of the Society of Naval Architects and Marine Engineers will be held in Assembly Room No. 1, Engineering Societies building, 29 West Thirty-ninth street, New York, on Thursday and Friday, Nov. 16 and 17. The annual dinner will be held in the Astor Gallery of the Waldorf-Astoria, on Friday evening. A feature of the dinner will be the public presentation of the John Fritz medal for 1911 to Sir William H. White, for notable achievements in naval architecture. The medal has been awarded by a board of 16 selected in equal numbers from the American Society of Naval Engineers, American Society of Mechanical Engineers, the American Institute of Mining Engineers and American Institute of Electrical Engineers. The preliminary program of papers for the meeting is as follows:

Thursday, Nov. 16.

"On the Maximum Dimensions of Ships," by Sir William White, honorary member, K. C. B., F. R. S., D. Eng.

"Dock Facilities of New York City; Present Facilities and Proposed Improvements and Enlargements," by Hon. W. J. Barney, deputy commissioner of docks and ferries, New York City.

"Some Model Basin Investigations of the Influence of Forms of Ships Upon Their Resistance," by Naval Constructor D. W. Taylor, United States navy, vice president.

"The Resistance of Some Types of Merchant Vessels in Shallow Water," by Prof. H. C. Sadler, member of council.

"Panama Canal and American Commerce," by Lewis Nixon, member of council.

"Experiments on the Froude," by Prof. C. H. Peabody, member of council.

"The Effect of Waves Upon a Taffrail Log," by Prof. H. A. Everett, member.

Friday, Nov. 17, 1911.

"The Raising of the Dry Dock Dewey," by Naval Constructor L. S. Adams, United States navy, member.

"The Best Arrangement for Combined Reciprocating and Turbine Engines on Steamships," by George W. Dickie, member of council.

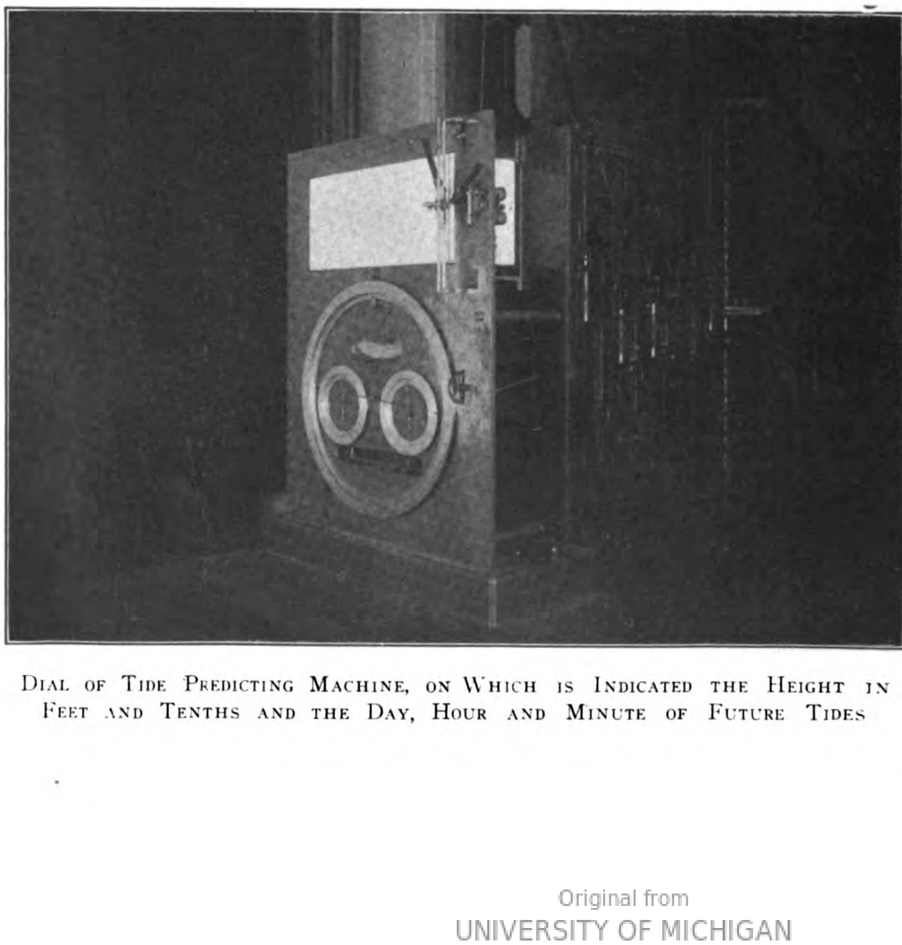
"Various Arrangements of Turbine Propulsive Machinery," by E. H. B. Anderson, member.

"Ship Calculation, Derivation and Analysis of Methods," by Naval Constructor T. G. Roberts, United States navy, member.

"Economy in the Use of Fuel Oil for Harbor Vessels," by Capt. C. A. McAllister, U. S. R. C. S., member.

"The Marine Terminal of the Grand Trunk Pacific Railway," by W. T. Donnelly, member, Prince Rupert, B. C.

"Cargo Transference at Steamship Terminals," by H. McL. Harding.



DIAL OF TIDE PREDICTING MACHINE, ON WHICH IS INDICATED THE HEIGHT IN FEET AND TENTHS AND THE DAY, HOUR AND MINUTE OF FUTURE TIDES

The Remarkable Garston Dock's Coal Loading Hoisting Plant

By Frank C. Perkins

AT THE Garston docks of the London & Northwestern railroad, there are in operation some unique hydraulic coal tips, shown in the accompanying two photographs, Figs. 1 and 2, the former showing the steamer Narvarino loading coal with the four hoists operating simultaneously, while the latter shows the passage of coal from one chute to the hold of the vessel Ailsa, the chute being in the raised position.

At the Garston docks, the largest vessel dealt with was the steamer Narvarino, 415 ft. long, 52 ft. beam, and she loaded 8,500 tons of coal at the New Stalbridge tips, the four tips being operated simultaneously into this steamer, as seen in Fig. 1.

It may be stated that the Garston docks, with their adjacent warehouses and storage grounds, coal reception lines and general marshaling sidings of the London & Northwestern Railroad Co. are situated on the upper Mersey, about four miles south of the Liverpool docks and on the same side of the river. It is of interest to note that the growing importance of Garston as a general and coal shipping center is largely attributable to its geographical position, since it is in close proximity to the manufacturing districts of Lancashire, Yorkshire and the Midlands. It is also within an exceptionally short haul from the South Lancashire and North Staffordshire coal fields.

The Stalbridge dock has a width of entrance 65 ft., the depth of water on sill being 25 ft. to 35 ft., and the water area 14½ acres, while the berthing space is 3,170 ft. Altogether at this dock, there are 16 portable hydraulic cranes with lifting capacity of 50 cwts. and two portable hydraulic cranes with lifting capacity of four tons. The extensive coaling facilities provided, as seen in the illustration, Fig. 1, utilize the four movable hydraulic tips, each of 30 tons capacity, fitted with anti-breakage appliances and end doors on shoots mechanically controlled by operator. These tips are of the latest and most up-to-date type, and capable of tipping coal into vessels at any height up to 45 ft. from quay level. The four tips are capable of operating simultaneously into the same vessel.

The lock, which is 276 ft. long, in connection with this dock enables craft also to enter or leave the other docks approximately two or three hours before or after high water, communication passages existing between the Old, North and Stalbridge docks.

The North dock has a width of entrance of 55 ft., the depth of water on sill being 18 ft. to 28 ft., and the water area eight acres, while the berthing space is 2,400 ft. It may be stated that at this dock are shear legs of 40 tons capacity; 13 portable hydraulic cranes with lifting capacity of 30 to 50 cwts. For coaling, there have been provided two movable hydraulic tips, each of 30 tons capacity, fitted with anti-breakage appliances, and end doors on shoots mechanically controlled by operator. Both tips can be used for one boat at the same time. There are also four fixed high level tips of less capacity.

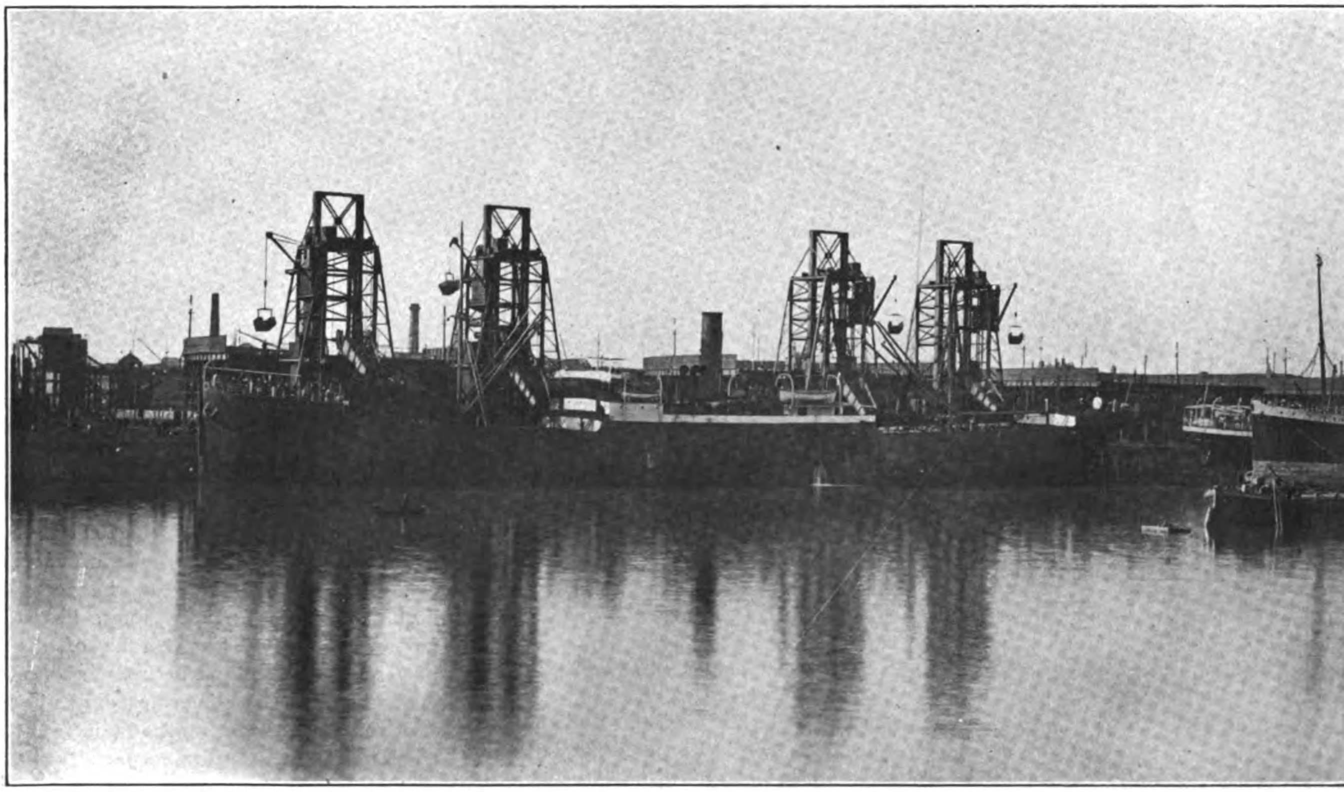


Fig. 1—Showing the Narvarino Under the Coal Chutes

The old dock has a width of entrance of 50 ft., the depth of water on sill being 5 ft. to 25 ft.; the water area is six acres, while the berthing space is 2,160 ft. There are 15 portable hydraulic cranes, with lifting capacity of 30 to 50 cwts., and one hand crane of 10 tons. For coaling, there are three fixed high level tips.

It is held that there are about 48 acres of storage ground specially leveled for timber and provided with sidings at convenient distances from each other, so as to admit of cargoes being sorted, piled or selected, as may be necessary.

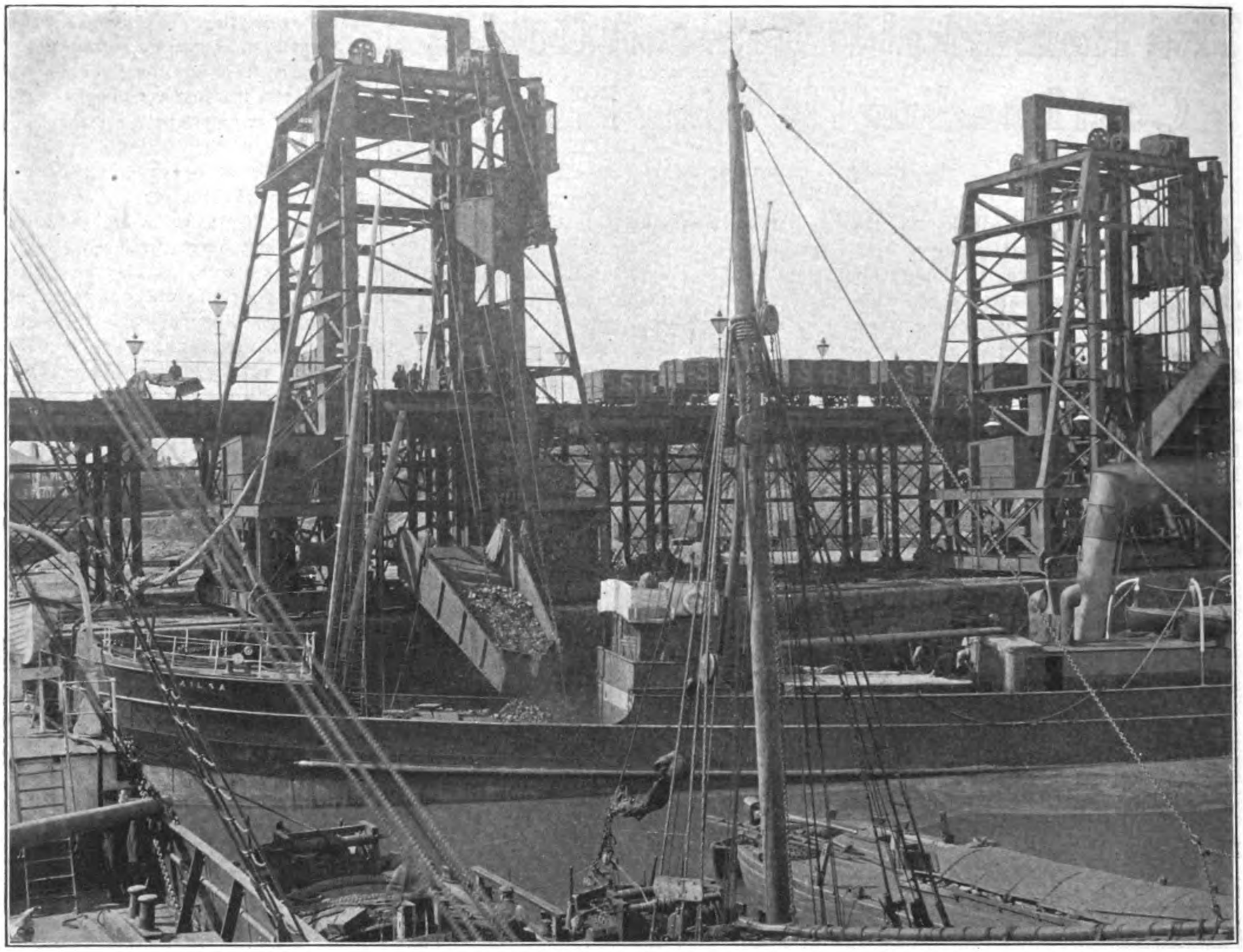


FIG. 2—THE AILSA COALING

Special accommodation has been provided for heavy logs, and traveling cranes are available for stacking, which are capable of piling logs to a height of 30 ft.

The coal shipments are conducted day and night, a complete electrical installation being in operation sufficient to light the dock entrances, coal hoists, quays, sidings and storage area, as well as the extensive shunting and marshaling yard on the estate. This system of lighting is also extended to portable lamps for use in the holds of vessels, wherever the nature of the cargo will permit.

As Garston is a railway port, goods are transferred direct from ship to railway wagon, or vice versa, thus reducing handling and obviating costly cartage, advantages representing a great saving to merchants. The additional area provided by the Stalbridge dock is a great factor in insuring dispatch, the fine range of coal tips, which are of the most modern type, supplying unsurpassed facilities for the expeditious shipment of coal.

The coal fields and manufacturing districts of Lancashire, Staffordshire, Yorkshire and the Midlands are in close proximity to Garston, and the geographical position of the port should prove of immense advantage to merchants and steamship owners alike, whose business connections are with those centers of activity.

It is maintained that the London & Northwestern Railroad Co. control the entire working of the docks, which are, of course, directly connected with their main line system, and through the latter with the systems of all the railroad companies in the country. There are 70 miles of sidings at the port, of which eight miles are actually or on alongside the quays, and therefore available for direct working of cargoes from ship side to trucks, or vice versa. The railroad company has two passenger stations at Dock Road and Church Road, and these are about five minutes walk from the docks.

Extensive Use of Concrete Chutes in Dry Dock Work

Dry dock No. 4 of the Brooklyn navy yard is nearing completion and when finished it is estimated that 60,000 cu. yds. of concrete will have been placed. This huge reinforced concrete dry dock has a length of 700 ft., a width of 110 ft., and a depth of 35 ft. over the sill adequate for the reception of a vessel 685 ft. long, 108 ft. beam, and about 50,000 tons of displacement. This structure involves many unusual engineering difficulties and the concreting methods have attracted much attention, especially the use of the chutes.

The depth of the concrete floor is on an average 8 ft. and the mixture of Universal Portland cement is 1:2½:5. The sand and gravel are raised from the barges to the storage bin from which they are delivered directly to the measuring and charging hoppers of a 2-yd. and a 1-yd. Ransome mixer which discharge through a chute into 2-yd. wooden hopper dumping cars with vertical sliding gates. Cement to the amount of 20,000 bags is stored adjacent to the concrete plant and is elevated to the charging platform by a chain elevator. The cement is tested at the factory in Pittsburgh and is stored in bins until required.

The concrete cars in trains of three or four cars, hauled by narrow-gage locomotives, are delivered on the exterior belt tracks to any required portion of the dock, where they dump into hoppers at the top of wooden chutes 20 in. wide and 20 in. deep that are inclined about 2½:1 and reach nearly to the bottom of the dock on the center line. These chutes are supported between pairs of wooden trusses 5 ft. deep. Through the bottom of each chute there are five holes 10 in. in diameter with vertical pipes leading from them to wooden chutes parallel with the axis of the drydock and at right angles to the main chutes.

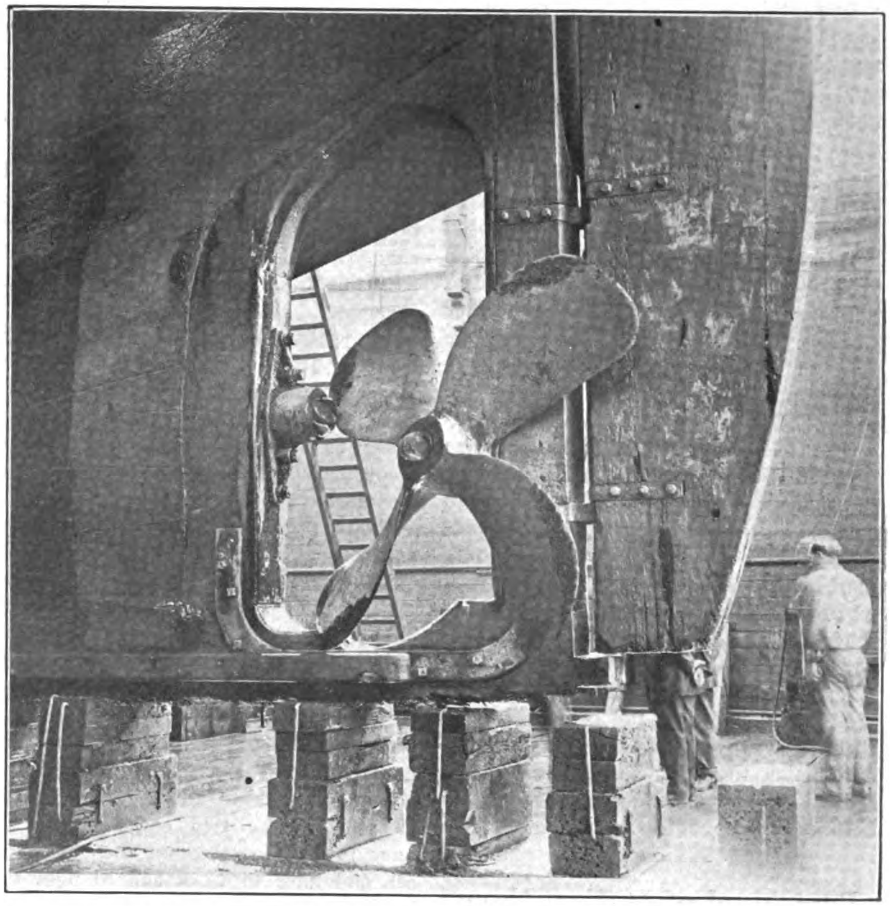
The longitudinal chutes have about the same inclination as the transverse chutes and are made of any required length to distribute the concrete where required on the floor, either by discharging from the lower end or through round holes made at intervals in the bottom of the chute. Ordinarily the concrete flows readily through the chute with very little scraping or hoeing, approximately equal portions of it dropping through the successive holes and pipes. Whenever necessary, however, the discharge through the different holes can be regulated by closing them with sheet-iron covers or by building dams across the chute below them. Contrary to the usual experience the concrete can be moved away from the Ransome mixers as fast as ready and the product of the plant is limited by the rapidity of supply to the mixers. The bottom is concreted in 20 x 135 ft. monolithic strips across the full width of the dock. Each strip contains about 675 yds. of concrete, which are continuously laid in from 14 to 24 hours, concrete being delivered simultaneously from both sides of the drydock through two main transverse chutes.

The work is being executed by the Holbrook, Cabot & Rollins Corporation, Boston, Fred Holbrook, general manager, and G. J. Clark, engineer.

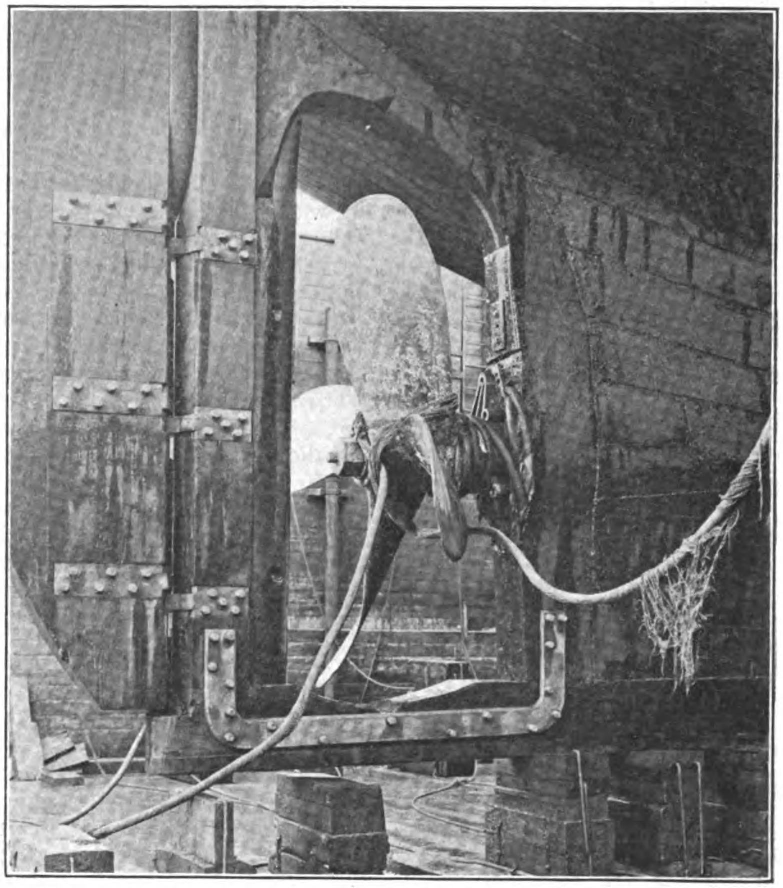
Two Curious Accidents

Few steamers have the good fortune to carry their wrecked propeller to port with them after the wheel has parted from the shaft while at sea, as was the case of the Swayne & Hoyt steamer Pomo, which was repaired at the ship yard of the Union Iron Works, at San Francisco recently.

The Pomo was on its way from a North Pacific coast port, and when about 300 miles from San Francisco,



SHOWING HOW THE POMO CARRIED HER BROKEN WHEEL INTO PORT



THE PACIFIC CABLE CAUGHT IN THE WHEEL OF THE CHARLES NELSON

lost her propeller and was forced to accept a tow to the Union Iron Works, where she was docked for repairs. When the water had subsided from the dock, it was found that the large wheel was securely lodged in the propeller well, being jammed in such a manner that it was impossible for the action of the waves to dislodge it.

Another freak job which the Union Iron Works was called upon to deal with recently was that of the steamer Charles Nelson which, in coming up the Bay of San Francisco to her berth, picked up the Western Pacific cable in her wheel.

The telephone and telegraph service between San Francisco and the cities of Alameda county is maintained through cables, which are anchored to the bottom of the bay. The landings are marked by huge signs and it is only when the cable is cast adrift by tide or other causes that there is any excuse for a vessel coming in contact with one. In the case of the Nelson, unusually high water had cast the cable adrift so that it was an easy matter for the obstruction to entwine itself around the screw. The picture shows the cable before it was cut away.

Personnel of Italian Navy

Charles de Grave Sells, of Genoa, well known in naval circles, contributes an article on the "Progress of War Ship Engineering" in Mr. Fred T. Jane's annual *Fighting Ships*. He says that with the close attention with which changes in the British and United States navies are followed, it is not surprising that Italy has considered the question as to the advisability of having a universal type of naval officer who could serve either in the engine room or on deck. The minister of marine of Italy referred the question to a special commission, composed of members of the different corps, the chief of the staff being the president and the executive branch being represented by admirals. The commission came to the unanimous conclusion that the entry into the navy and the earlier training of naval officers and engineer officers ought to be uniform for both, but decided against the feasibility of the universal type of officer. The minister of marine in announcing the decision to the chamber of deputies, gave the following reasons as to the non-advisability of any such change:

"The commission were of opinion that a change of such a radical nature should not be made unless it were absolutely indispensable in the interests of the service, which in the case in question it certainly was not; for during the period of over 50 years, since the use of machinery had been introduced in the navy for the propulsion of vessels, no difficulties had arisen in the service of the engine rooms to justify any such change.

"Nor could the fact that such a plan had been adopted in other navies modify our view in the slightest, as it may be that special circumstances, which for us do not exist, may have induced the change; and in any case it will be advisable to wait and see how the experiment that has been commenced in these other navies turns out, and the teaching from such results will put us in a condition to draw from them counsel and advice, and enable us to profit by such experience and provide accordingly with a full knowledge of the matter.

"It is very necessary that we should be in accordance as to the exact significance of the words 'universal type'.

"From my point of view, we cannot possibly be agreed save in one sense only, namely, that the two corps, naval officers and engineer officers, whose method of entry into the navy is at present different, have instead a common method, for it is only natural that we should seek to amalgamate as much as possible the two corps which will have to live together on the same vessel, and have to work and to fight side by side.

"But from the nature of the case the two corps *must* be absolutely distinct the one from the other, as their functions are so completely different. The duties of the chief engineer are executive; he has to be a man of great capacity and technical ability, a thorough specialist in the working of the engines and all relating to them, and in whom the commander ought to be able to place the greatest reliance; such specialization can only be attained in the completest way by leaving aside the military nautical studies of which he has no necessity whatever.

"In order to become a thoroughly efficient director of the machinery department, many years of constant application to study are required and many years of practical experience; while to become a naval commander of the best type, one may say that the whole of a lifetime is not sufficient for his needs, even when he possesses naturally all that is requisite in the way of temperament."

St. Louis-Gulf Steel Barge Line

The Business Men's League of St. Louis and the St. Louis Real Estate Exchange are interested in forming a new company to be known as the St. Louis-Gulf Steel Barge Line Co., to take over the Mississippi Valley Transportation Co., which was organized by W. K. Kavanaugh of St. Louis about two years ago. It is announced that Robert H. Whitelaw will be president of the new company and Mr. Kavanaugh vice president. Mr. Whitelaw is a member of the firm of Whitelaw Bros., paint and oil dealers, and has not hitherto been associated in an active way with vessel property. The company will be capitalized at $400,000, divided equally between preferred and common stock. The Mississippi Valley Transportation Co. operated a barge and tow boat built for it by the American Bridge Co. It is understood that additional barges are to be constructed. Concerning the new enterprise President Whitelaw made the following statement:

The St. Louis-Gulf Steel Barge Line Co. has great possibilities, and I am confident it will soon take a prominent place in the transportation development of St. Louis. It should place us in position to compete with other cities in markets which have heretofore been closed to St. Louis on account of rate conditions, and will certainly prepare the way for that greater development which must come to the Mississippi Valley upon the completion of the Panama Canal, now so near at hand.

When activity in the management of the barge line was suggested to me, it seemed too great a sacrifice for me to make, as it would be necessary for me to lessen my activity in the business in which I had been engaged for so many years, but the reputation, public spirit and financial responsibility of the gentlemen active in the organization, and who will be associated with me in the management, influenced me to accept the call. I fully appreciate their confidence in me, and the responsibility of the office, and am arranging my business interests so that I may devote a large share of my time and energy to the development of this enterprise.

Some little time will be required to perfect our organization, acquire necessary additional equipment, terminal facilities, etc., but these matters of detail will be pushed to completion at the earliest possible date. Our transportation problems will be similiar to those of other water routes, and our policy will be to co-operate with, rather than to antagonize any railroads or steamship lines, cultivating and stimulating, wherever it may be possible, an interchange of tonnage. We will aim to put St. Louis products into new markets.

CRUDE OIL MARINE ENGINES*

By James H. Rosenthal.

THE problem of converting fuel into power as directly as possible is one with which, for many years, engineers have been occupied. No doubt the achievements in the construction of gas engines using gas produced from coal or coke, as well as in engines using the light distillates of oil or spirit, by the dissemination of knowledge of essential details connected with their construction, have materially assisted in the development of the crude oil engine, which is dealt with in this paper, and great credit is due to the designers and constructors of such engines.

Engines using the light distillates of oil or spirit may be properly called "Explosion engines," and although these are used for launches and small pleasure craft to an enormous extent,

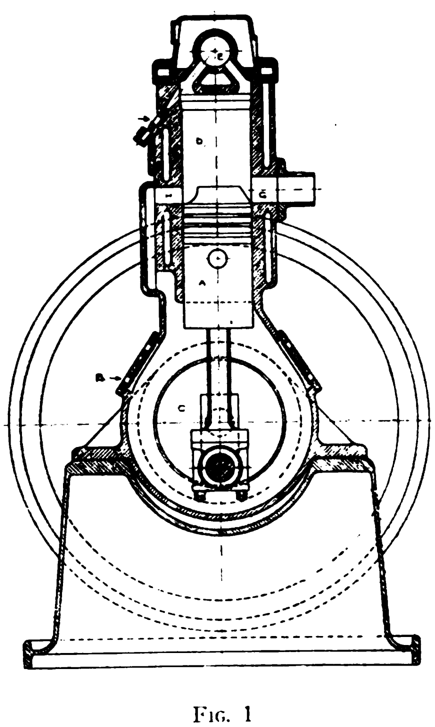


Fig. 1

and are now made so simply that they can be worked by persons who are not skilled in mechanics, the nature of the fuel used being of a low flash point, and necessarily dangerous and high priced, precludes their use and development for large powers.

The aim which designers of crude oil marine engines have had before them is to get as near as possible to the simplicity of the ordinary marine engine, and this aim has been achieved to the extent of producing a type of crude oil marine engine, which is reversible, and in which energy is imparted to each stroke of the piston.

How far such engines will displace steam for marine propulsion, no one at the present time can foretell, but the general opinion is to the effect that whilst their substitution for the reciprocating engine up to what are considered in marine practice moderate sizes, may be looked for in the near future, as yet they are not looked upon, even assuming the present conditions of the oil supply would admit it, as a substitute for the steam turbine for marine propulsion.

The advance so far made with these engines, and the energy with which eminent engineers are pursuing the subject, leads to the expectation that mechanical difficulties will not stand in the way of the aforesaid application.

The advantage of these engines, even for small craft, is in the greater safety of the fuel, as compared with petrol or paraffine, and as compared with steam, in a saving in weight and space, and they admit of a larger radius of action of a vessel, owing to the fact that the same weight of fuel gives more power.

The use of such engines on submarines is already will established in some of the principal navies of the world. For cargo vessels and yachts, and vessels of a commercial type, trials have already been made, and a good many such engines are running and under construction. For naval vessels—such as torpedo-craft—designs are under consideration, and large engines are being constructed.

The question of the oil supply is a very important factor; whilst a ship can readily carry enough crude oil for three times the distance of travel that it can on the same displacement if coal and steam boilers are provided, yet difficulties of replenishing the oil supply are bound to cause serious consideration to a ship owner before deciding to equip his vessel with oil engines. Moreover, the present price of the crude oil being more than double that of Welsh coal, and three times that of other classes of coal, does not admit of much saving in the cost of fuel in running a vessel, but, even under the present conditions, a saving is established in weight and in crew.

It goes without saying that this relative cost of coal and crude oil does not apply to places in the world which are reasonably close to oil fields, or in which crude oil is stored in such quantities that the possibility of obtaining it is assured.

It is not considered necessary in this paper to go into the question of places where crude oil can be obtained, and the price of it in such places, as these are points with which ship owners are well acquainted.

Definite results of the total saving in the working of a ship are not generally available, although within a year or two, undoubtedly, they will be, but Messrs. Swan, Hunter & Wigham Richardson, the eminent shipbuilders, state as the result of the working of a ship, the Toiler, of 2,700 tons, that

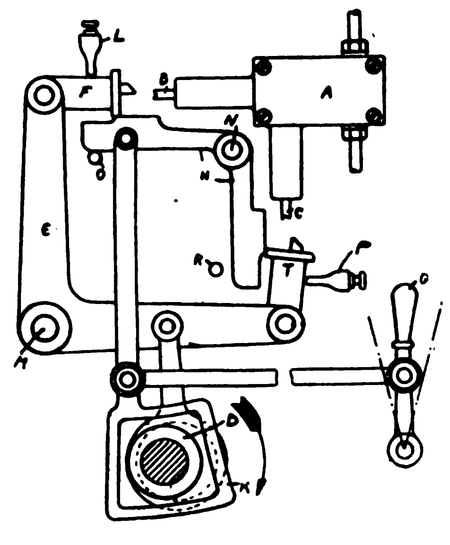


Fig. 2

the comparison of oil at 45/- per ton, and coal at 12/6 per ton, resulted in a saving in money of £3 18s 8d per day.

Of the ship Vulcanus, of 1,900 tons, which is fitted with Diesel engines of 450 B. H. P. in service between Rotterdam and Hamburg, the English agents write:

"The average consumption corresponds to one ton of fuel oil per 100 knots."

The two types of engines which are particularly dealt with in this paper are the Bolinder engine, as an exam-

*Read at the eighty-first annual meeting of the British Association for the Advancement of Science, held at Portsmouth.

ple of a crude oil reversible marine engine which is not on the Diesel principle, but in which the ignition of the fuel takes place in a heated chamber at the top of the cylinder, by some termed a "hot pot," and the Diesel engine proper. The former type is one which is essentially suitable for small craft, and it has been largely fitted on fishing vessels and barges. Considerable numbers of them have been made for sea work. Messrs. James Pollock, Sons & Co., the representatives for this engine in England, have fitted them in 24 barges and cargo boats, three fishing boats and eight launches; and Babcock & Wilcox, Ltd., of Sydney, have fitted them likewise in several fishing boats running in Australian waters. It is found that there is very little difficulty in training one of the crew of a fishing vessel to work the engine. The sizes generally used run from 10 to 30 H. P., although sizes up to 150 H. P. have been made and are running. A drifter on the east coast has such an engine of 120 H. P., and Plate No. II gives the appearance of vessels fitted with these engines. The construction is explained by Fig. 1 and the reversing gear by the diagram, Fig. 2.

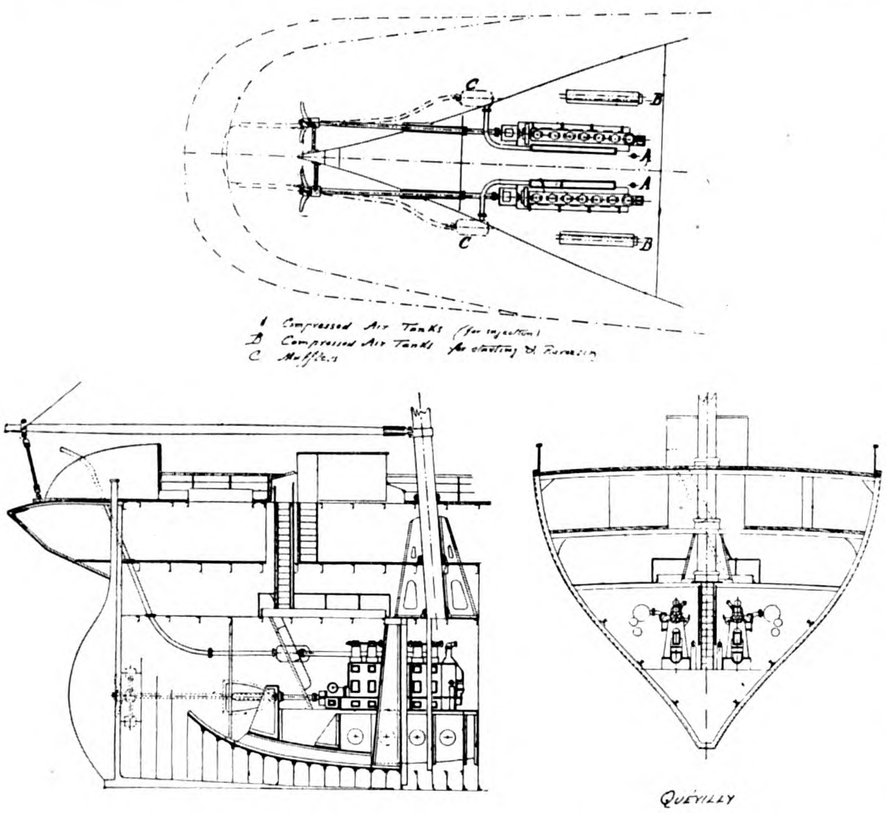


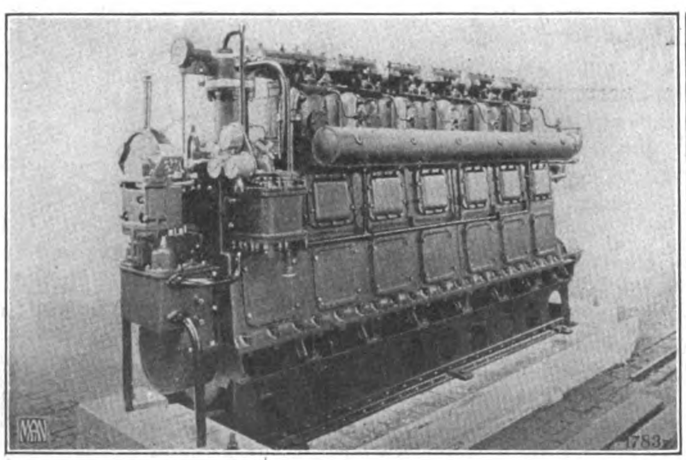
FIG. 3—GENERAL ARRANGEMENT OF ENGINE ROOM OF QUEVILLY

Messrs. Bolinders have sent Capt. Neilson's report regarding the barge Travers, belonging to Val de Travers Ashphalte Paving Co., running between Havana and the Port of Spain, as follows:

Trinidad, Jan. 15, 1911.

"During the voyage of 23 days and a distance of about 1,850 miles, through gales of wind and high seas, the engine has at all times been kept running and at a regular speed, not the same as a steam engine running at a gallop when the vessel is pitching, and nearly stopping when the stern gear goes down."

Fig. 1 shows this engine, which is of the two-cycle type, compressing its scavenging air in the crank chamber. When starting the engine to work a blow lamp is inserted through the cover of the ignition chamber, E. When this ignition chamber is heated to a dull red (which takes about 10 minutes in the smaller sizes), the engine is turned either by hand, in the smaller sizes, or by compressed air in the larger sizes, and a charge of fuel is admitted through the fuel valve F. It is ignited by contact with the heated chamber E which forms the cylinder head. The air for combustion which, by the previous uncovering of the passage H passed from the crank case into the cylinder, is compressed by the upstroke of the piston. The port G is the exhaust port; this commences to be uncovered before the air admission port H, and the gases commence to exhaust as soon as it is uncovered, and their expulsion is completed by air entering through the port H being slightly compressed through previous downward stroke of the piston in the crank case.



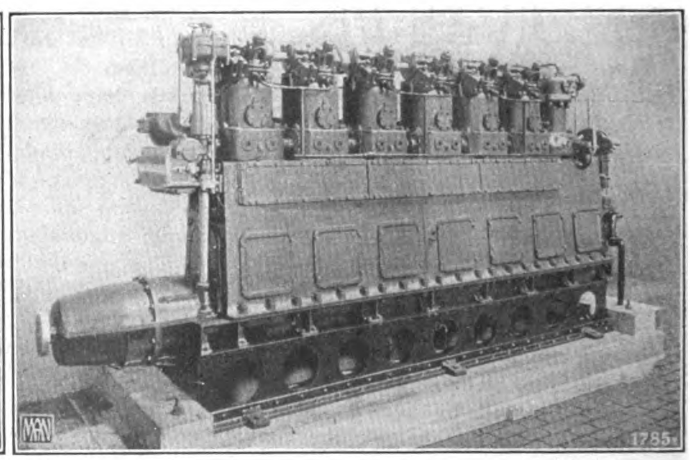


FIG. 4 SINGLE-ACTING NURNBERG ENGINES FIG. 5

The cylinder is water cooled, and if sea water is used, although this gets hot, it is kept in continual circulation through a pump attached to

the engine, and, consequently, does not get concentrated enough to deposit salts. After the engine is started, the blow lamp can be extinguished, as the combustion of the fuel in the

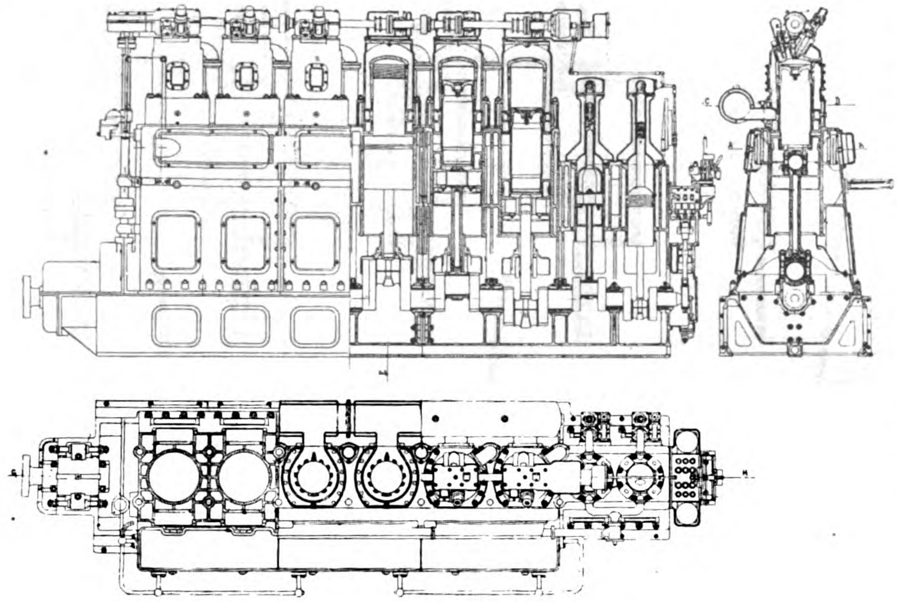


FIG. 6—SINGLE-ACTING NURNBERG OIL ENGINE

cylinder keeps the chamber E at a sufficient heat.

The reversing operation is illustrated by Fig. 2. In the diagram A is the fuel pump case, and B and C are the fuel pump plungers. These are operated by a toggle F, at one end of a bell crank E, and by toggle T at the other end, this bell crank E

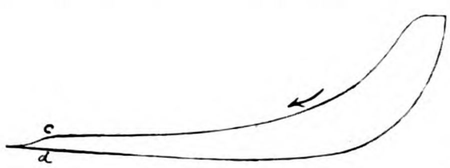


FIG. 7

being operated by an eccentric on the engine crank shaft. Normally the toggle F is in operation, but when the engine is reversed, the reversing lever pulls link K on to the friction disc D, and alters the position of the bell crank H. This pushes the toggle F out of action, and allows the toggle T to go into action on the fuel pump C, so that the reversing is effected by temporarily throwing out of action the fuel pump which, in normal running, injects the fuel at the top of the stroke, and substituting for it another pump timed so as to inject a charge before the piston reaches the top of the stroke; this checks its upstroke, and drives it down in the reverse direction. Owing to the previous putting out of action of the fuel pump, the engine is slowed down so that the shock of reversing is minimized. When the engine has reversed, the bell crank E resumes its former position, and fuel is again injected at the top of the stroke for normal running.

As stated, the larger engines are started by compressed air. This is stored in an air vessel conveniently placed in the engine room. In the first instance this vessel must be charged from some independent source, such as a hand pump, but afterwards the engine itself is used for this purpose, in the following manner:

When the engine is finished with for propelling purposes, the fuel is cut off one cylinder, the other one continuing to drive the engine, the propeller being de-clutched.

The cylinder from which fuel is cut off continues, in other respects, its normal cycle, and as it compresses the air on its up stroke, this compressed air is passed through a valve into the reservoir.

The starting is effected by putting the engine just over the top center and opening the air valve sharply by hand, thereafter the fuel valve is opened and the ignition of the fuel takes place in the hot cylinder head chamber E, as before described.

The type of engine for larger powers is that on the Diesel principle, on what is called the "Diesel cycle of combustion." This cycle of combustion is based upon the fact that when air is compressed to 450 lbs. per square inch, it attains a temperature of about 1,000 deg. Fahr., and this ignites the atomized crude oil with which it is brought into contact.

The Mashinenfabrik Augsburg Nürnberg A. G., Germany; Messrs. Carels Freres of Ghent; Messrs. Sulzer of Winterthur; Messrs. Schneider of Creusot; Messrs. Nederlandsche Fabriek Van Werktuigen en Spoorweg Material, Amsterdam, and Messrs. Burmeister and Wain, Copenhagen, are the firms principally working at this development at present.

Messrs. Schneider work with Messrs. Carels Freres, as do also Messrs. Vickers, Sons and Maxim.

The firm, however, which so far has done most work in developing the two-cycle reversible, marine crude oil engine on the Diesel principle is the Maschinenfabrik Augsburg Nürnberg. This firm has an enormous experience in large gas engines and in building Diesel engines for stationary purposes, and now has several eminent marine engineering firms abroad as licensees, and in Great Britain the licenses are in the hands of Messrs. Harland & Wolff; the Fairfield Shipbuilding & Engineering Co., Ltd.; Sir W. G. Armstrong, Whitworth & Co., Ltd.; Messrs. Cammell, Laird & Co., Ltd.; J. S. White & Co., Ltd.; Yarrow & Co., Ltd., and Babcock & Wilcox, Ltd., and the extensiveness of this organization, and the author's connection with it, in addition to the fact that these engines are up to the present the most largely adopted, has led to its being put forward as an example of the latest development of the reversible two-cycle crude oil marine engine. It is constructed single-acting and double-acting.

The crude oil marine engine on the Diesel cycle of combustion made by the Maschinenfabrik Augsburg Nürnberg, hereinafter referred to briefly as the Nürnberg engine, found its first introduction for propulsion of submarines. The before-mentioned advantage of engines working with crude oil, which is difficult to ignite, applies most forcibly to such craft, and the advantage of such engines being reversible without requiring clutches or gearing, is a recognized one.

Submarines are now coming into use which have in them as much power as two engines of 900 H. P. each, and even larger powers are contemplated, and these reversible engines have been adopted in the German, French, Danish, Dutch, Italian and American navies.

From the records which have so far reached the author, this engine appears to be the most economical in weight for the power produced. In the type used

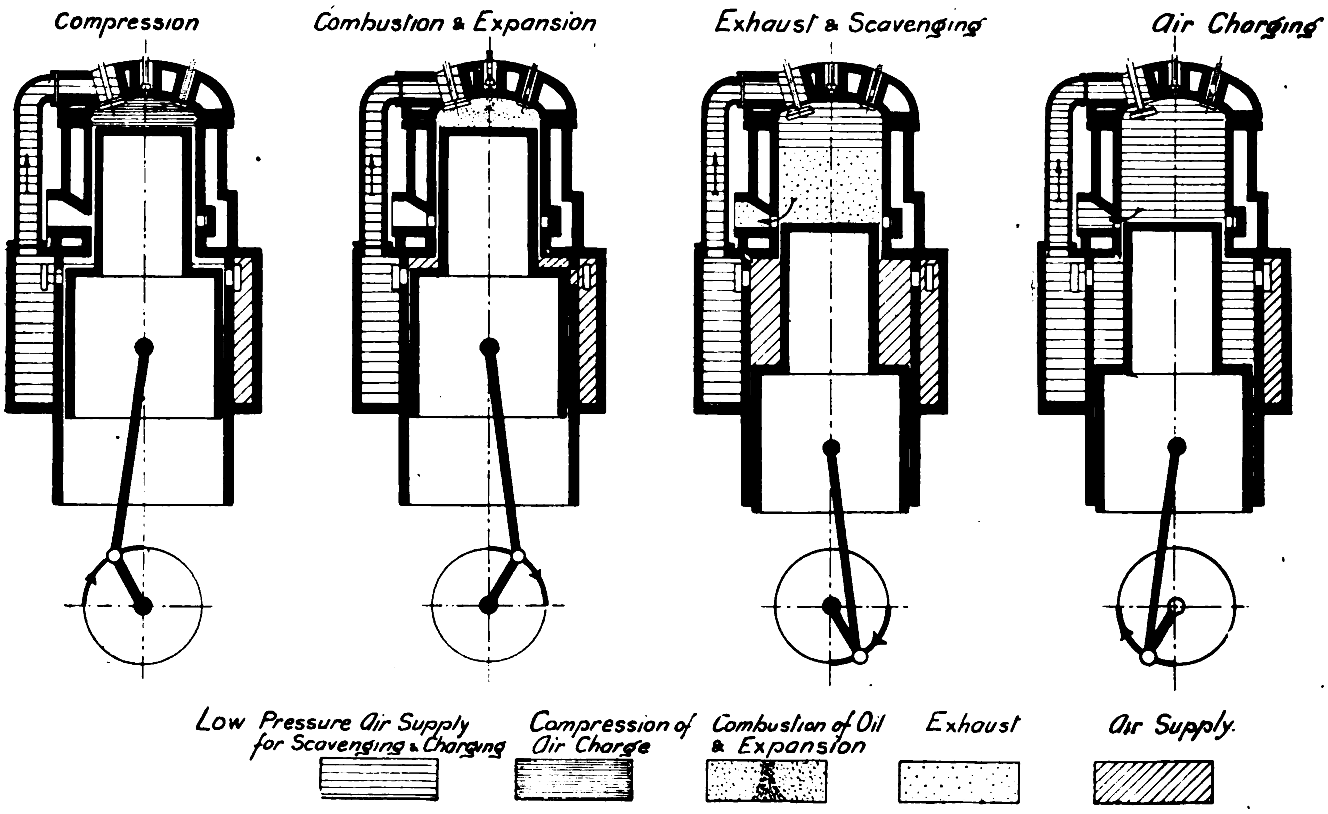


FIG. 8—DIAGRAM DESCRIPTION OF WORKING TWO-CYCLE ENGINE

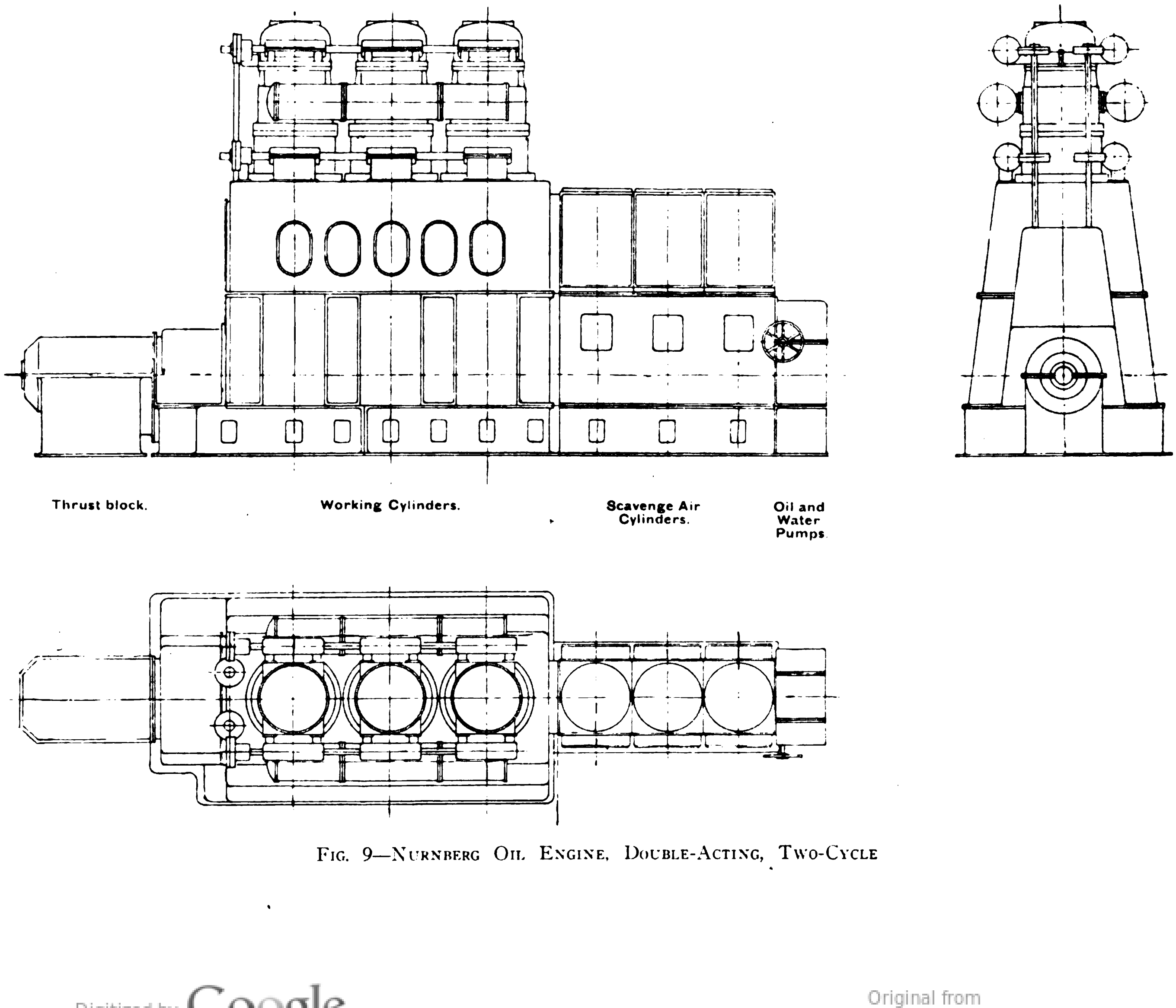


FIG. 9—NURNBERG OIL ENGINE, DOUBLE-ACTING, TWO-CYCLE

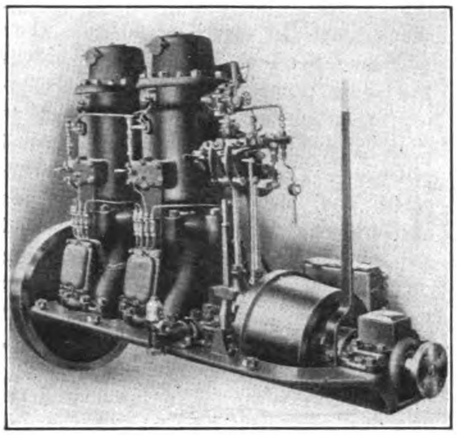


PLATE I.—BOLINDER ENGINE

for submarines, the average weight of fairly large sizes is 35 to 37 lbs. per effective horsepower.

This engine for use in submarines, pinnaces, and any case where great lightness is required, is run at com-

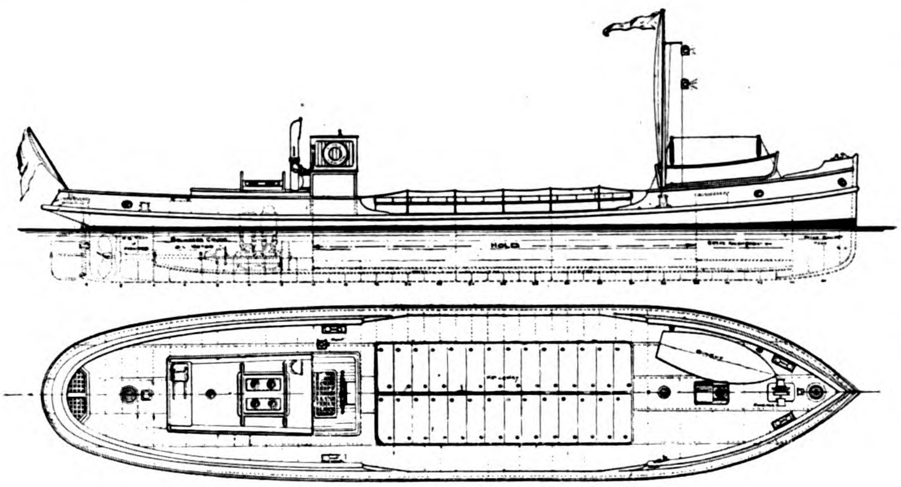


PLATE II—BOLINDER ENGINE BARGE

paratively high speeds varying from 550 r. p. m. for a 200 H. P. engine to 420 for an engine of 900 H. P. For lightness the framing and bedplates are made of manganese bronze, and gear covers, etc., of aluminum.

The Nürnberg Works, have already made 22 or 24 of these engines, and have others in hand. Fifteen have been made for submarines. The American licensees, the Holland Submarine Boat Co., have in hand 14 such engines, and the French licensees four. In this country, Messrs. J. Samuel White & Co. are building two engines of 150 B. H. P. for pinnaces for the Argentine navy; and one for a pinnace for their own use, and Messrs. Yarrow & Co. are building an engine of 300 B. H. P.

At Nürnberg two such engines of 2,400 H. P. each are under construction at the present time.

Above is an illustration of two single-acting engines in a large French sailing ship, the Quevilly, for such, as an auxiliary, the Nurnberg engine is well suited.

The same principle of engine has been used but built with less regard for saving in weight and at less cost per horsepower, for slower running commercial installations. These engines run at speeds from 360 to 160 r. p. m.

Of this type the Nürnberg Co. have already built 16 engines for tugs, yachts, cargo and passenger boats. All the before-mentioned engines are single-acting.

Plate III shows the tug Nurnberg, belonging to Messrs. Van der Schuyt, of Rotterdam, and which is fitted with a 300 H. P. Nürnberg engine, running at 250-300 revolutions. The saving of space in the boat, compared with the space occupied by a steam installation amounts to 25 per cent.

Plate VI shows the space occupied and extra accommodation provided by installing Nürnberg engines on some 56-ft. pinnaces for the Argentine navy. Both boats and engines are being built by Messrs. J. Samuel White & Co., of E. Cowes.

The reversible double-acting two-cycle engine is on the eve of being tried commercially for long distances on a vessel of the Woermann Line, and on a vessel of the Hamburg-Amerika Line, both vessels being built by Messrs. Blohm-Voss. In the case of one vessel there are two engines of 1,000 H. P., and in the other, two engines of 1,500 H. P. In all these engines there are only three cylinders. The former engines have gone through shop tests, both in the works of the Nürnberg company at Nürnberg, and in the works of Messrs. Blohm & Voss (one of the engines having been built by each firm), and these shop tests have shown them to run most satisfactorily. The following are the particulars of one of the 1,000 H. P. engines: No. of cylinders, 3; diameter, 18.9 in.; stroke, 25.6 in.; revolutions of the engine, 125; diameter of crank shaft, 12 in., and weight of engine, 75 tons. Limits of speed from 40 to 125 revolutions normally.*

The double-acting engine most closely resembles the reciprocating marine steam engine, everything below the cylinders being practically identical and open for inspection.

Description of Single-Acting Engines.

The single-acting engines are made

*The engine has been run quite satisfactorily up to 220 revolutions per minute.

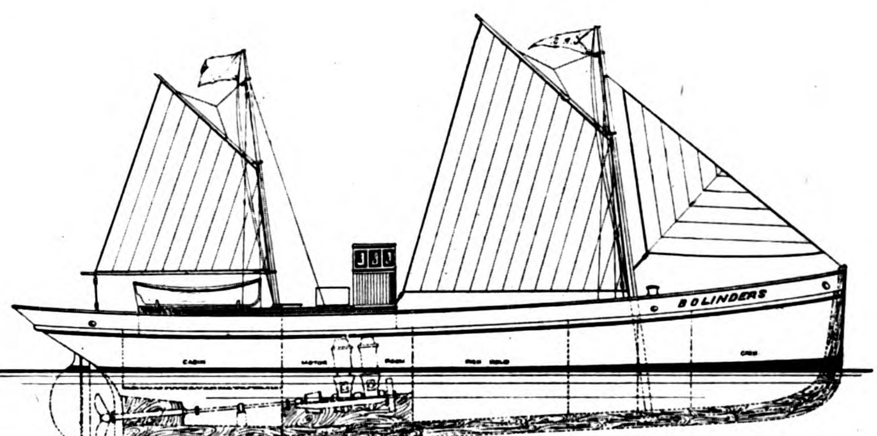


PLATE II—BOLINDER DRIFTER

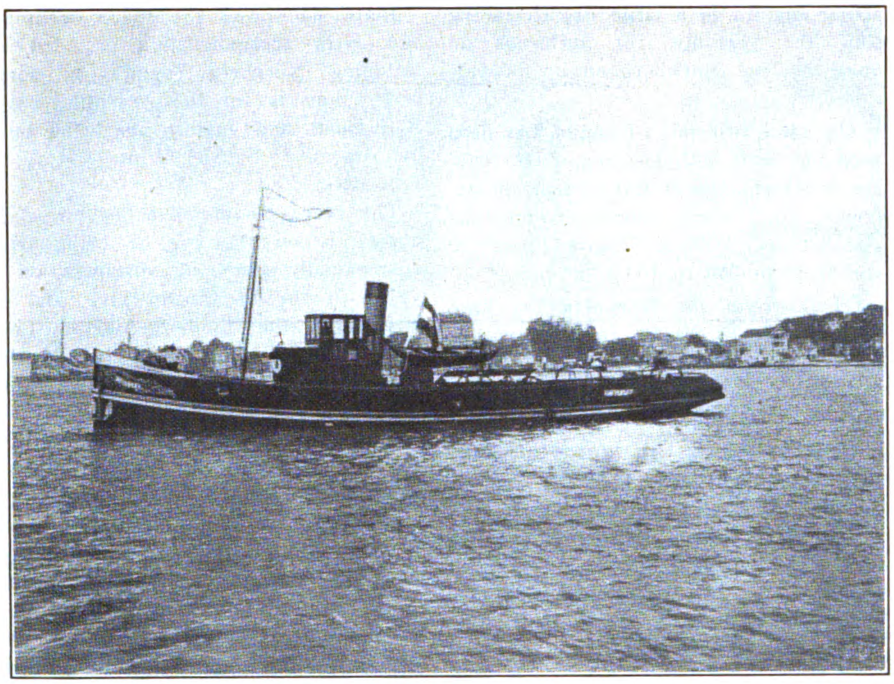


PLATE III—TUG NURNBERG, FITTED WITH 300-H. P. ENGINE

with from four to eight cylinders, depending upon the power, six cylinders being the most usual arrangement, and ranging from 150 to 900 H. P.; eight cylinders are adopted where the same power is to be obtained as on a six cylinder, but with a lesser number of revolutions.

For all engines on the Diesel principle, an air compressor and a means of storing compressed air are essential. The air compressor may be attached to the main engine, or it may be separate and independently driven.

Figs. 4 and 5 are those of a 150 H. P. single-acting engine running at 550 revolutions; while Fig. 6 shows a part section of a similar engine of 300 H. P. In this engine there are six cylinders in line, and at the end of the engine, in line with it, are the compressors, and at the forward end of the compressor the oil and water circulatating pumps, and the reversing gear.

The single-acting engines are made entirely enclosed. The cylinders are jacketed and cooled with sea or fresh water. The connecting rods are of the usual gudgeon pin type used in single-acting engines.

The piston is of two diameters, the upper part being the working piston above which the combustion takes place. The lower and larger diameter works in a liner and forms the guide as well as the compressor for the scavenge air. This air is drawn in on the down stroke, and on the up stroke is discharged at a pressure of about 5 lbs. into a reservoir formed in the upper part of the crank case, and from this is led to the scavenge valves.

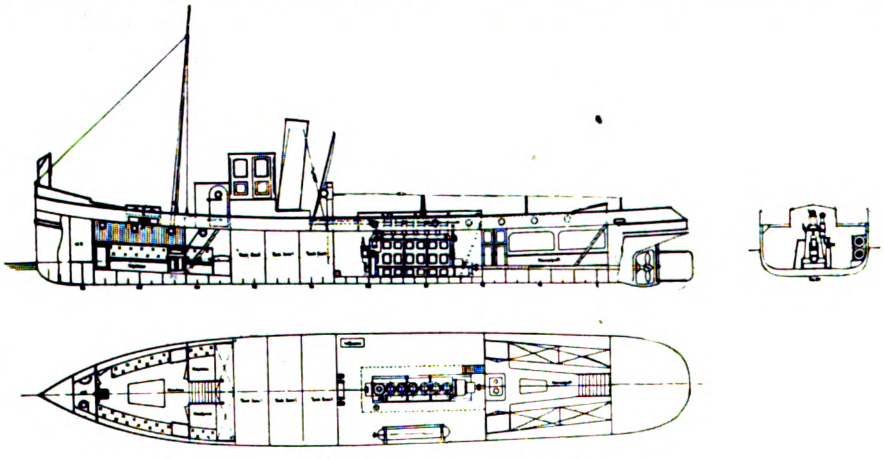


PLATE III—SECTIONS OF TUG NURNBERG

A cam shaft, running along the tops of the cylinders, carries for each cylinder one cam to operate the fuel valve, and one for the scavenge valve, as well as the ahead and astern maneuvering cams.

This shaft is driven from the crankshaft by a vertical spindle, fitted with helical wheels at each end, seen at the after end of the engine. The vertical spindle is not solid all the way up, but is fitted with a coupling or clutch, which allows the lower part to revolve through 30 deg. before driving the upper part and the cam shaft. Thus, if the engine is reversed, the crankshaft and lower part of the vertical spindle will revolve through 30 deg. before the upper part and cam shaft move, and this will bring the cams into a fresh position relative to the crankshaft. In this new position they will give the fuel and scavenge valves the same point of opening and closing, relative to the piston travel as they previously had in the ahead position. The cam shaft, at the forward end, drives a tachometer for showing the speed of the engine, and an emergency governor for cutting off the fuel supply, should the engine race.

From this vertical shaft are driven, by worm gear, the pumps for supplying lubricating oil to the cylinders. There is a visible feed, and the oil is positively delivered by a force pump to each cylinder.

All the bearings are lubricated by oil under pressure, which is farced round by a pump working at the forward end of the engine. This oil is collected in the crank pit and passes through a filter and cooler, and is then pumped round the bearings again.

The thrust block is made either as part of, or attached to, the main bed plate, and thrust collars are turned on the after end of the crankshaft.

The bearing is adjustable so that there should be no chance of the crankshaft getting out of line fore and aft with the guide position.

In the larger sizes of engine this oil, passing through the crosshead and the piston rod, is pumped round the hollow top of the working piston also to keep it cool.

Forward of, and in line with, the cylinders is fitted a two stage air compressor driven from an extra crank.

This delivers air at about 800 lbs. pressure into the injection air vessel, which stands alongside the engine. From this vessel a pipe leads to the fuel valve on each cylinder, the pressure of air for injecting the fuel be-

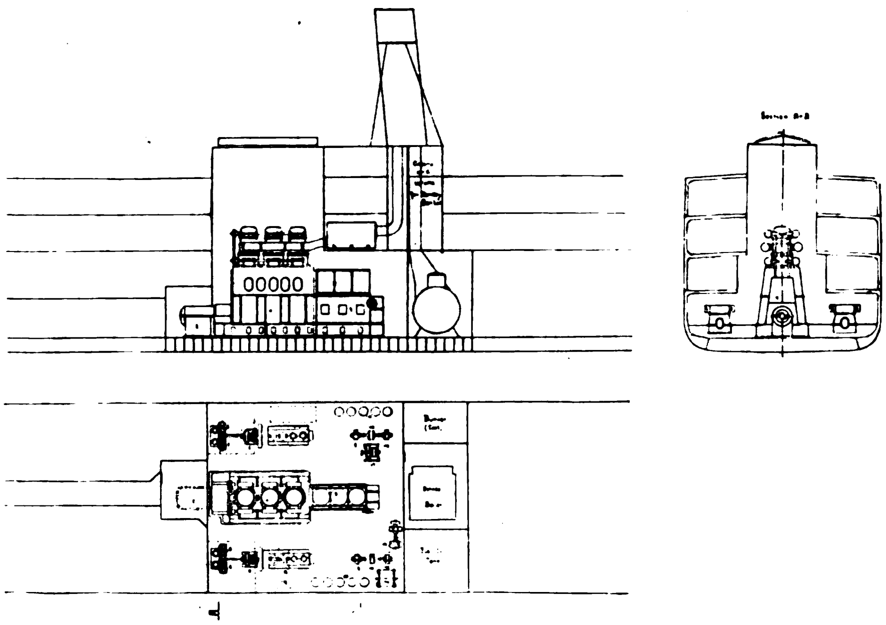


PLATE IV — ARRANGEMENT OF SINGLE SCREW NURNBERG ENGINE, 2,500 H. P.

ing regulated by a valve. The surplus air is led from this vessel to the starting air reservoirs fitted on the side of the engine room, so as to keep up the reserve of air necessary for maneuvering.

At the extreme forward end of the crankshaft is an eccentric from which motion is given to the lubricating oil pump, the cooling water pump and the fuel oil pumps.

Of these latter there is one for each cylinder, forcing the fuel oil into the fuel valve casing. When the needle valve lifts the charge of oil in the casing is driven into the cylinder by the injection air.

The speed of the engine is varied by regulating the quantity of this charge of fuel oil, the piston of the maneuvering lever controlling the lift of the suction valves of the fuel oil force pumps. When reversing, the fuel oil is cut off automatically by this lever, until the engine starts by air in the new direction, when it is again supplied to the fuel valves.

In addition to the fuel and scavenge valves each cylinder is fitted with an air starting valve. This is operated by compressed air from the reservoirs which acting on top of a piston, presses the valve open.

The reversing of the engine is accomplished by the operation of either a lever or a handwheel on bell crank tappets, which operate air valves. The head of each cylinder is provided with a fuel valve, with its injection air attachment, and a scavenge valve, and these are operated by two of the cams on the cam shaft, and, in addition, there is a starting air admission valve arrangement operated by the other two cams. These cams are set for going ahead or going astern, and admit air to the piston of the air valve in the cylinder head.

As before stated, there is always one of the pistons in a position to go ahead or astern on receiving an impulse of compressed air, and as the engine starts to go ahead or astern in this manner, the movement of the lever also operates the fuel admission valve, so that before the air is entirely shut off the cylinders are firing; the same takes place in whichever direction the engine is started. The first movement of the lever from the center point also operates an air pipe for opening simultaneously the air valves on all the cylinders for an instant, to enable any gases in the cylinders to be blown out.

The capabilities of these engines for maneuvering were demonstrated on the tug Nürnberg at Rotterdam.

Repeatedly on trials and in ordinary work the times taken to effect changes have been observed to be: Full speed ahead to full speed astern, 3 seconds; full speed ahead to stop, 2½ seconds, and stopped to full speed ahead, 2½ seconds.

The engine having started on fuel, now pursues its normal cycle which is as follows, and is shown by Figs. 7 and 8 and a working model.

Just before the piston reaches the top of its stroke, the fuel valve opens and a charge of fuel is injected by means of the injection air, the pressure of which is higher than that of the air compressed on the up-stroke of the piston.

The fuel oil is atomized in the fuel valve, and entering in a spray mixed with the injection air, it ignites, the ignition being due to the temperature of the compressed air in the cylinder. This combustion continues for about one-twelfth of the stroke, when the fuel valve again shuts; and the gases expand, driving the piston down, until the top of the piston uncovers the exhaust ports.

The gases are then free to escape to the atmosphere through the silencer. Their expulsion is made certain by the admission of scavenging air which has been compressed to about 5 lbs. pressure, and which, entering by the scavenge valve, sweeps out the burnt gases and leaves the cylinder full of fresh air, which is compressed

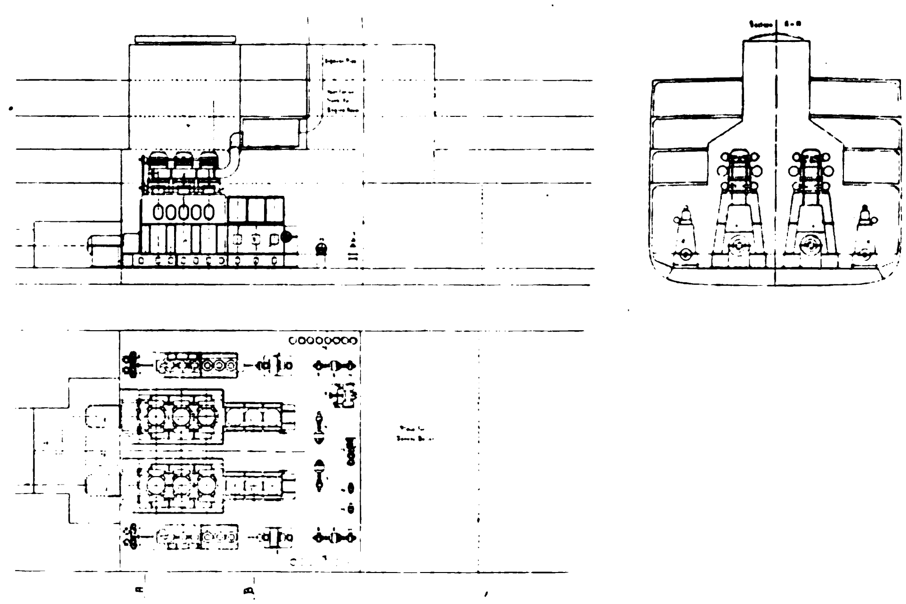


PLATE IV—ARRANGEMENT OF TWIN SCREW NURNBERG ENGINE, 3,750 H. P.

to about 450 lbs. per square inch by the upstroke of the piston.

The scavenging air is compressed in the case of double acting engines by pumps driven from the main engine.

The consumption of fuel oil varies from 0.52 lbs. in small engines to 0.45 in large engines.

This is assuming that the oil fuel has a calorific value of about 18,000 B. T. U., which is the average for these oils.

Description of Double-Acting Engine.

The double-acting engine is built with three working cylinders and the scavenge air cylinders arranged on either one of two plans to suit the exigencies of the ship design.

In one arrangement, which is shown by Fig. 9, these scavenge cylinders are in line with the working cylinders, and their pistons worked from a continuation of the main crankshaft.

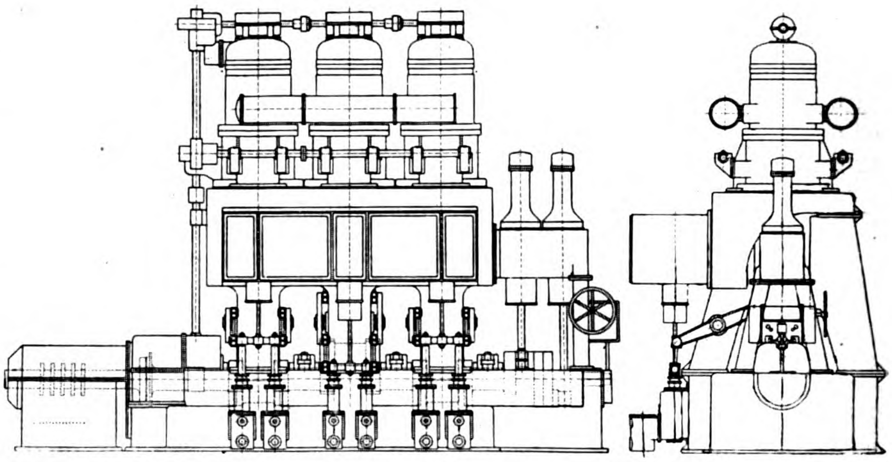


PLATE V—NURNBERG DOUBLE-ACTING MARINE ENGINE, TWO-CYCLE, WITH SIDE SCAVENGE AIR PUMPS

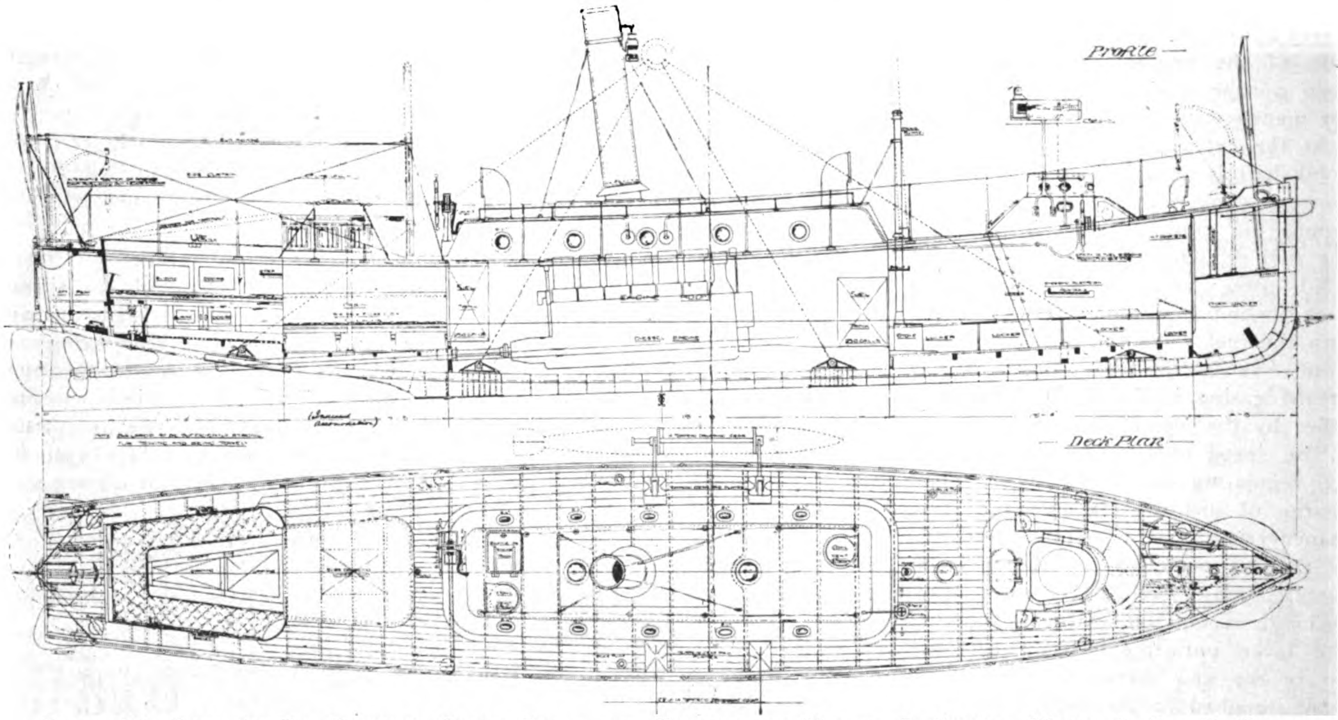


PLATE VI—FIFTY-SIX-FT. PINNACE, BEING BUILT AND ENGINED BY MESSRS. J. SAMUEL WHITE & CO., E. COWES

In the second arrangement they are placed on the side of the engine and worked by rocking levers from the main crossheads.

This arrangement saves length and enables the compressing cylinders to be put on the main frame and worked by a continuation of the main shaft. Plate V shows such an arrangement.

As will be seen, the framing below the cylinders is very massive, and the crosshead, guides, and connecting rods are made just as in a steam engine.

The pistons not being stepped to form scavenging pumps separate scavenging pumps are essential.

The cylinders are provided at the bottom end with stuffing boxes, the form of stuffing box being that which has been used successfully for a number of years in the large gas engines made by the Nürnberg company with most satisfactory results.

The cycle of operation is precisely the same as in the single-acting engine, except that it takes place at each end of the cylinder alternately, and for this reason there are cam shafts both top and bottom of the cylinders.

In order to get a better distribution of fuel oil and more even burning, the valves at the bottom are in duplicate.

The reversing and starting gear is similar to that on the single-acting engines, but actuates starting air valves at each end of the cylinders.

There is also an arrangement whereby in starting or running slowly the fuel may be cut off one end of the cylinders, leaving the other end firing only, and so running as a single-acting engine.

The bearings, as in the single-acting engines, are lubricated by oil under pressure, and this same oil is used to cool the working pistons, being pumped through the cross-heads and piston rods.

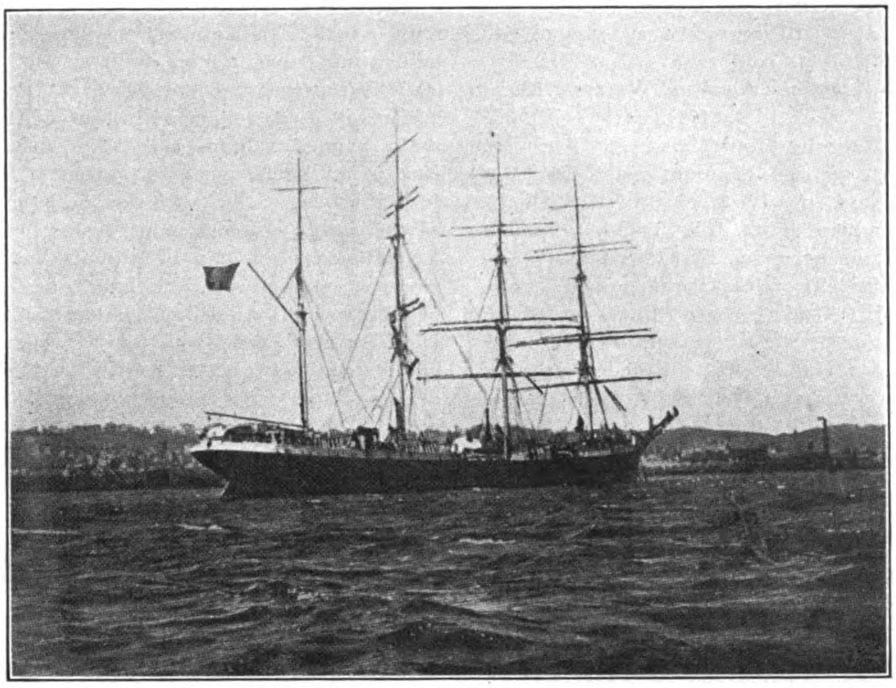


PLATE VII—SAILING SHIP QUEVILLY, FITTED WITH TWO 300-H. P. NURNBERG ENGINES

The advantage of using oil is, that should any leakage occur no harm is done, whereas if water be used and leaks down into the crank pit it seriously affects the lubricating quality of the oil circulating round the bearings.

For auxiliary purposes, on a ship, non-reversible engines are used driving dynamos to enable the auxiliaries to be worked by electricity, or a separate small steam installation may be used. On the single-acting engines hitherto, the compressor has always been driven off the main engine, and is in line with the other cylinders. In the double-acting engines, which so far have been constructed for the vessel for the Woermann line, there are separate compressor engines. This appears to have advantages in maneuvering. Designs, however, have been got up in which the compressors are driven from a continuation of the crank shaft, the scavenging pumps being driven by rocking levers. In all these installations a small auxiliary compressor is usually fitted for maneuvering.

"The Graveyard of the Pacific"

AS A RESULT of the inquiry into the Ramona disaster, which was wrecked on Spanish Island Sept. 10, Capt. Martin Taafe was charged with unskillfulness, lack of judgment, with running at full speed during a fog, and attempting to navigate the dangerous passage between Cape Decision and Spanish Island, where the distance between foul ground is less than half a mile and without any aids to navigation.

The trial was held before Capt. T. F. Dearing of Carl Lebners, and their decision was recently given, that Capt. Taafe showed lack of judgment in not rejecting the dangerous pass and taking a safe course off the southwest of Coronation island, consequently they suspended Capt. Taafe's license for six months, adding that their finding would have been more severe had there been any aids to navigation in the vicinity.

The graveyard of the Pacific, as Alaskan waters are not inappropriately called by mariners navigating those dangerous waters in the north, has fewer aids to navigation and possesses fewer lighthouses than any other similar stretch of water in the world, and certainly none present so many dangers to be encountered, as the different Alaskan routes.

The total loss of the Ramona has therefore given a new impetus to the agitation which has been made at different times during the past ten years to the United States government for the provision of more and better aids to navigation in the district of Alaska, extending from the Portland canal, where the British Columbia coast line terminates, to different ports of call to the westward, as far as Nome and St. Michael.

Although Alaskan waters are better lighted and buoyed than they were ten years ago, the increase in these much needed "aids" has not by any means kept pace with the phenomenal growth in shipping and traffic. Petition after petition has been forwarded to congress, asking assistance, but without securing the adequate end desired; it, however, was a step in the right direction when Alaska was made a separate district, with headquarters at Ketchikan, under Commander E. H. Tillman, by an act of congress, approved June 17, 1910, but what is vitally needed is liberal appropriations for the provision of more aids to navigation. The lighthouse inspectors engaged in the duty of caring for and installing aids in Alaska, have recommended, and favor the erection of new lighthouses, new fog-stations, and numerous smaller lights and acetylene buoys; these officials are practical men, and know the difficulties, and appreciate the dangers that confront ship masters navigating the reef and island studded waters of the north.

That there is urgent need for assistance in the establishment of lighthouses in Alaska, becomes at once apparent when it is stated that the number of vessels totally lost since the year 1880 comes up to the appalling figure of 76; and the amount paid out by underwriters for these losses reaches the figure of nearly $7,000,000 and a sum nearly as great has been further paid out for vessels that have met with disaster, and subsequently been salved and restored to their owners. Insurance rates on Alaskan hulls are now as high as the traffic will bear and yet despite the high rates the underwriters have lost heavily on Alaskan business. Of course, while many of these total losses can be attributed to the mistakes of mariners, and from other causes incident to this particular trade, by far the greater percentage can be charged up against the fact of the inadequate and insufficient provision of aids to navigation. The frequent mishaps to passenger and freight steamships operating to Alaska has resulted in an almost prohibitive high rate of insurance, and which is now likely to undergo a further increase.

Not only has there been such a

heavy loss in floating property, but a heavy loss of life has consequently been entailed, but as to the exact number, no figures are available. This matter is a serious one.

Comparisons are always odious; but in a question of such moment as this, it is permissible to contrast the difference in the protection afforded shipping by the United States government, with that provided by the Canadian government. There is at present engaged in Alaska commerce between San Francisco and Puget Sound approximately 100,000 net tons of shipping; to take care of this enormous tonnage the United States government has provided from Portland canal, where the British coast line stops, to the different ports in Alaska but 47 aids to navigation. The territory covered by these 47 lights approximates 4,500 miles. Engaged in the Alaska trade at different times in the year are about 110 vessels, and these range from the small coaster to the large steamship liner, and also includes a number of sailing vessels, operated by the different packing and fishery companies. In addition to the natural difficulties and dangers of the northern waters such as ice, fog, storms of wind and snow, the masters of these vessels are confronted by the dangers of uncharted reefs and rocks, and unlighted islands and capes and their duties become doubly onerous because of the lack of sufficient aids to navigation.

In direct contrast to this and to the large fleet sailing to Alaska from United States ports, is the small fleet of steamers operating from Vancouver and Victoria, B. C., to southeastern Alaska. In a stretch of coast line not much more than 600 miles, the British Columbia government has provided 105 aids to navigation of different character and all of the highest efficiency. The number of vessels of Canadian register engaged in the northern traffic is 17, and their net tonnage ranges from 900 tons to the largest steamer of the Grand Trunk Pacific Railway Co.'s fleet of 1,600 tons each, and the former only ply as far north as Skagway, the latter to Prince Rupert.

It may be seen at a glance at the following concise and pertinent facts, how important and urgent this matter is and surely the proper authorities should give careful attention and mature consideration to the subject especially when it is remembered that with the year ending on Dec. 31 next, it has been figured by those who are intimately acquainted with the industrial activity of Alaska, that its commerce will represent a total of $40,000,000 in cold cash.

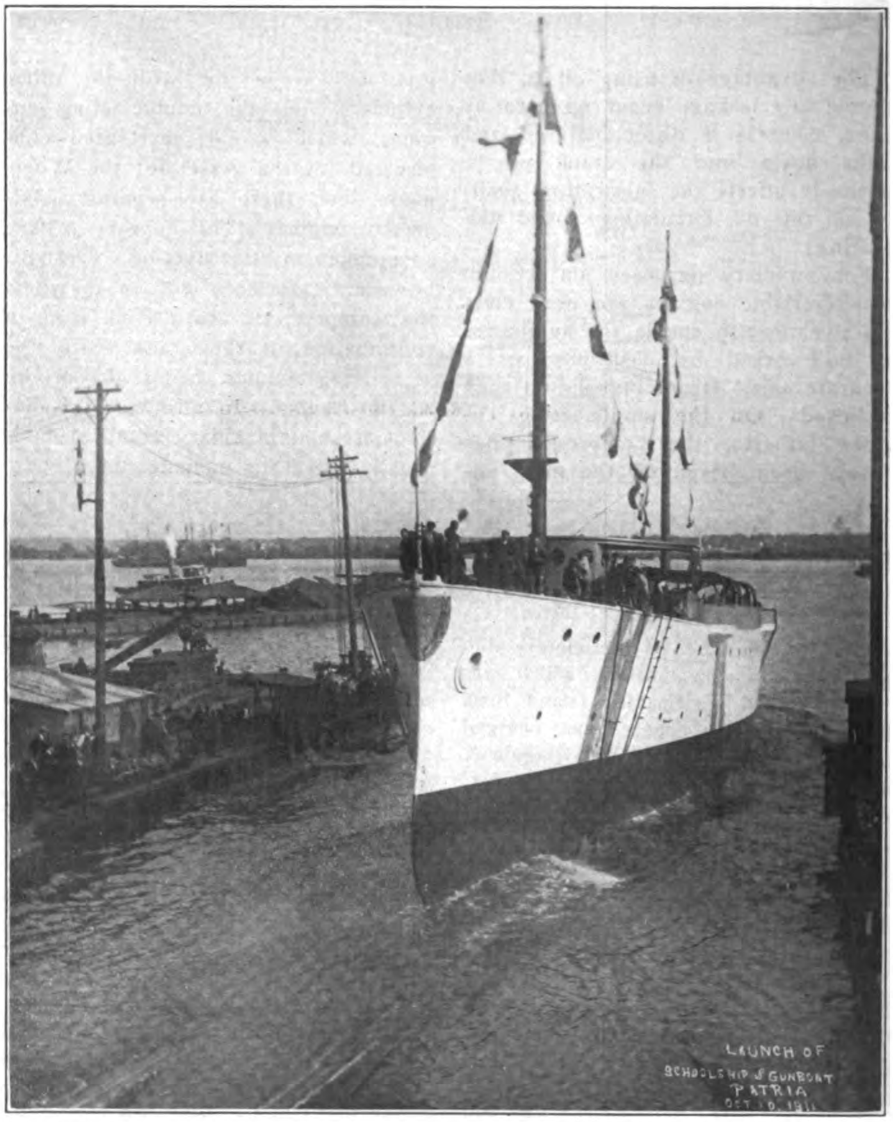
Wrecks in Alaskan Waters 1880 to 1911.

Vessels totally lost, 76; lives lost no records; amount paid for total losses, nearly $7,000,000; British Columbian lights, 105; British Columbian water traversed by United States vessels, 610 miles; United States lights, 47; Alaska coast line served by United States vessels, 4,500 miles; Canadian vessels engaged in the Alaska trade, 4; United States vessels engaged in the Alaska trade, 108.

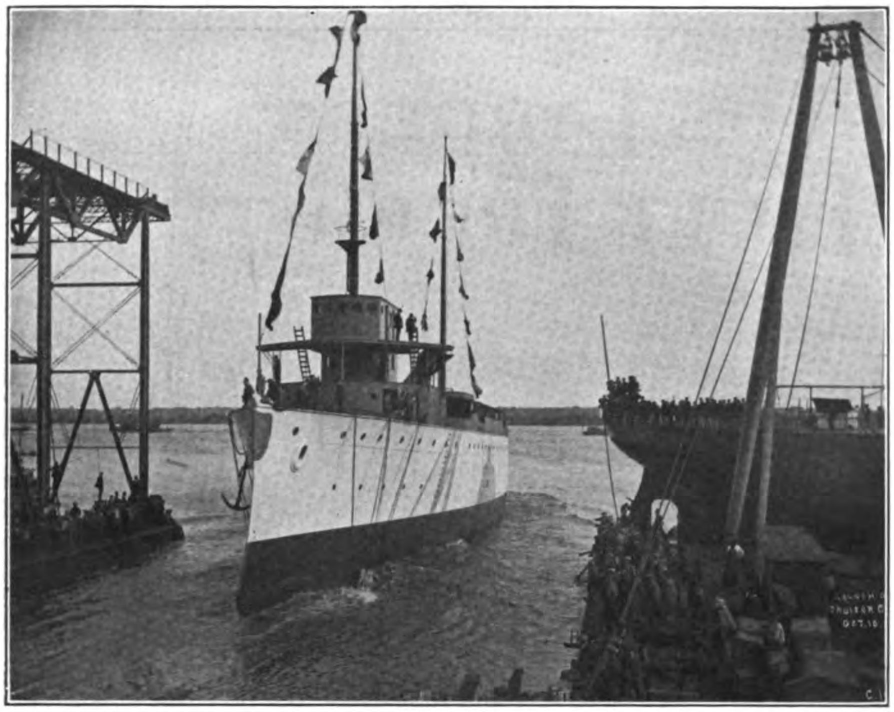
The above speaks for itself and with such an annual commerce amounting to such a big total as $40,000,000, representing the value of the exports in gold, copper and other minerals, canned salmon and other fish, furs of all kinds, whale products, and forest products, etc., to say nothing of the enormous coal fields ready for development; imports of mining machinery, stamp-mills, clothing, merchandise of all kinds and living supplies, surely Alaska not only needs, but is entitled to better protection for her mariners and shipping than at present obtained.

Warships for Cuban Navy

CRAMPS, Philadelphia, launched on Oct. 10 the twin-screw cruiser Cuba and the twin-screw gunboat and schoolship Patria for the Cuban navy. Senorita Mariana Gomez, daughter of the president of Cuba, christened the Cuba, while her sister, Senorita Narcisa Gomez, christened the Patria. These vessels constitute the nucleus



LAUNCHING THE SCHOOLSHIP AND GUNBOAT PATRIA FOR THE CUBAN NAVY AT CRAMP'S OCT. 10



LAUNCHING THE CRUISER CUBA FOR THE CUBAN NAVY AT CRAMP'S ON OCT. 10.

of the new Cuban navy. The Cuba is especially fitted up with quarters for the president, comprising a dining saloon, stateroom and bath. The Cuba is 260 ft. over all, 39 ft. beam and 26 ft. deep with a normal draught of 13 ft. with a displacement of 2,055 tons at that draught. She is designed for a speed of 18 miles. Her propelling machinery consists of two inverted vertical triple-expansion engines with cylinders 16 in., 26½ in. and 44 in. diameters by 26 in. stroke, supplied with steam from two water-tube boilers with about 135 sq. ft. of grate surface and 6,000 sq. ft. of heating surface, arranged in one compartment. A small auxiliary boiler will also be installed. These boilers will be operated under the closed stokehold system with an air pressure not exceeding 2½ in. of water for full speed steaming conditions.

The armament will consist of two 4-in. 50-caliber rapid fire guns, four 6-pounders, four 3-pounders, one 1-pounder and two 7 mm. machine guns of Colt's design. One 4-in. gun will be mounted forward, having a train of fire of 45 degrees abaft the beam on either side. The other 4-in. gun will be mounted aft with a train of fire of 45 degrees forward of the beam on either side. Four 6-pounders will be mounted on the main deck on each side, the forward pair having a train of fire from direct ahead to 60 degrees abaft the beam; the after pair having a fire from direct astern to 60 degrees forward of the beam. Four 3-pounders will be mounted on the main deck amidships, two on each side, with arc of train of 60 degrees forward and abaft of beam. Four 1-pounder guns will be mounted on the main deck between the 3-pounder guns, two on each side. Four searchlights will be fitted, one on each mast and two on the forward bridge.

The gunboat Patria is 185 ft. over all, 34 ft. beam and 22 ft. 6 in. molded depth, having 1,200 tons displacement at normal draught of 12 ft. Her designed speed is 16 miles. She will have two triple-expansion engines with cylinders 13, 22 and 36 in. diameters by 24-in. stroke, supplied with steam from two water-tube boilers to have approximately 100 sq. ft. of grate surface and 6,000 sq. ft. of heating surface, arranged in one compartment.

Her armament will consist of two 6-pounder rapid fire guns, four 3-pounders, four 1-pounders and two 7 mm. machine guns of Colt's design. One of the 6-pounders will be mounted forward with a train of fire 45 degrees abaft of beam on either side. The other 6-pounder will be mounted aft with a train of fire 45 degrees forward of beam on either side. The four 3-pounder guns will be mounted on the main deck, two on each side at the corners of the superstructure. The forward pair will have a train of fire from directly ahead to 60 degrees abaft the beam. The after pair will have a fire from direct astern to 60 degrees forward and abaft of beam. Four 1-pounders will be mounted on the main deck amidships, two on each side with arc of train of 60 degrees forward and abaft of beam. Two searchlights will be fitted, one on each mast.

Annual Report American Ship Building Co.

President James C. Wallace at the annual meeting of the American Ship Building Co., held in Jersey City, Oct. 11, reported to his stockholders that the year had not been "at all equal to previous ones either in volume or results, but probably equal to the average of most industries." The financial statement shows that the company has fared probably a little better than the average of most industries. Its net earnings during the fiscal year ending June 30 were $954,862, out of which $317,644 was set aside for depreciation and maintenance account, $553,000 distributed in preferred dividends, and the balance of $84,218, added to surplus, making the total surplus $6,480,193. It will also be observed that the company earned 1.1 per cent on common, but it was announced early in the year that no distribution on common would be attempted.

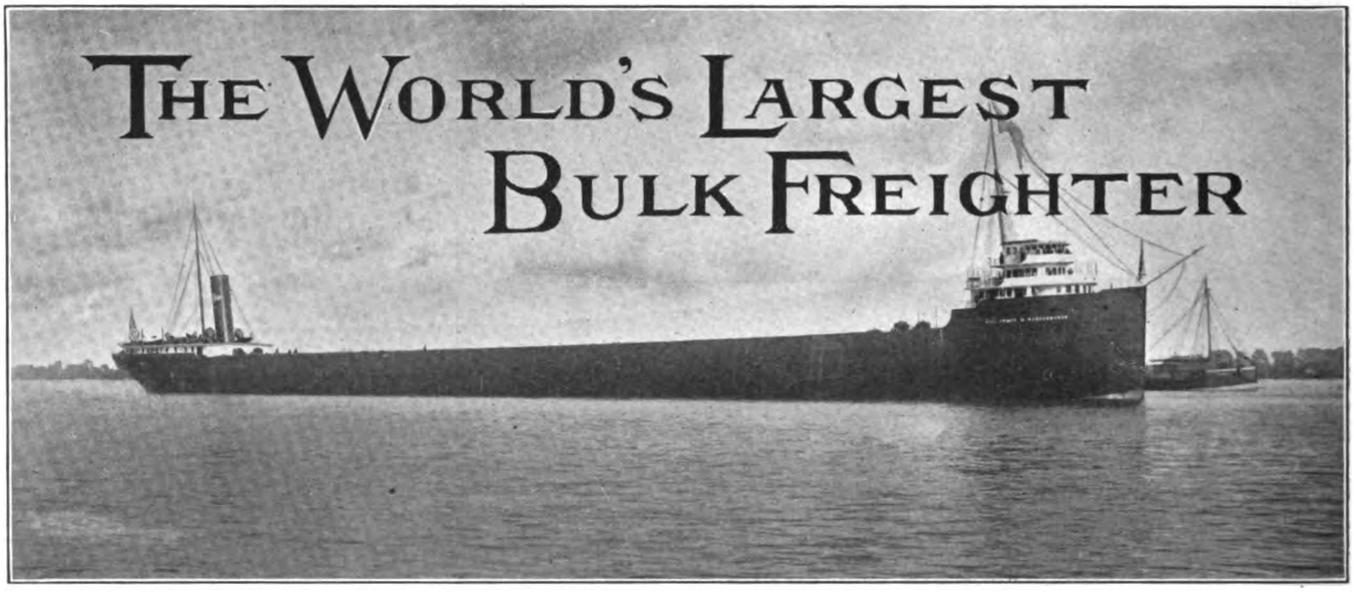
There are not many companies as conservatively capitalized and as soundly entrenched financially as the American Ship Building Co. Mr. Wallace stated that it had built 22 vessels during its fiscal year and had under contract eight vessels. Some of these vessels have since been completed, however, and a few additional contracts have been obtained. He regards the outlook for the coming year as not favorable owing to general conditions prevailing in the iron and steel trade and to the fact that at present the carrying capacity of the lake marine exceeds the probable tonnage to be freighted.

R. B. Wallace was elected a member of the board of directors, vice W. I. C. Carpenter, resigned, otherwise there was no change in officers and directorate.

Schuette Recording Compasses

Recording compasses made by the Schuette Recording Compass Co., Manitowoc, Wis., have been installed on the new passenger steamer Henry Woerman of the Woerman - West African Line and on the Capt. Finisterre of the Hamburg-South American Line.

THE WORLD'S LARGEST BULK FREIGHTER

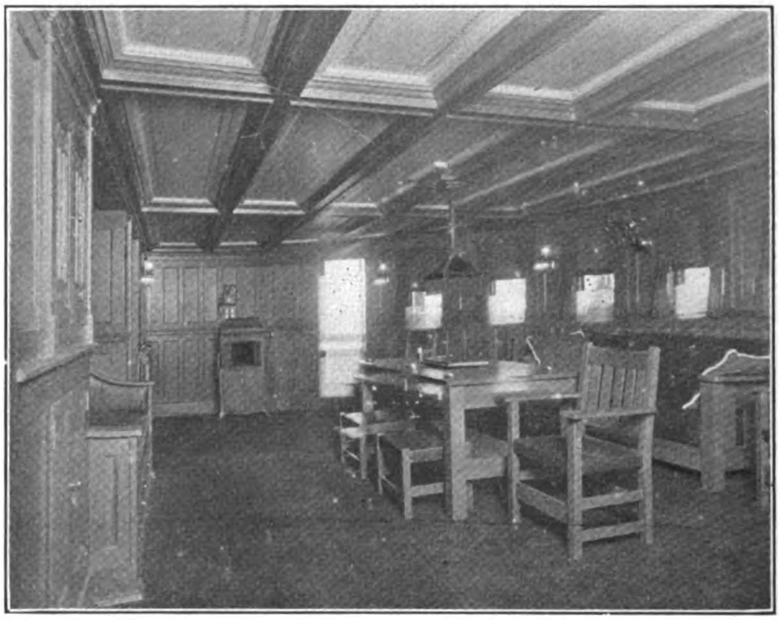


THE BULK FREIGHTER COL. JAMES M. SCHOONMAKER TAKEN AS SHE WAS LEAVING THE ECORSE YARD OF THE GREAT LAKES ENGINEERING WORKS FOR HER MAIDEN CARGO

THE bulk freighter Col. James M. Schoonmaker, of the Shenango Steamship Co.'s fleet, left the Ecorse yard of the Great Lakes Engineering Works at noon, on Sunday, Oct. 8, on her maiden journey, going to Toledo for coal. Col. James M. Schoonmaker, vice president of the New York Central Lines; C. D. Dyer, vice president of the Shenango Furnace Co.; J. B. Yohe, general manager of the Pittsburgh & Lake Erie railroad; Charles H. McKee, director of the Shenango Furnace Co.; Henry J. Irvin Jr., treasurer of the Shenango Furnace Co., and J. B. Obey, superintendent of the Pittsburgh & Lake Erie railroad, participated in the maiden trip. The advent of this steamer in lake trade is an event of more than ordinary importance, as it marks the first decided step beyond the so-called 600-ft. class. She is 10 ft. longer, 4 ft. wider and 2 ft. deeper than any bulk freighter on the lakes. The maiden trip was blessed with good weather. No day could be finer and the trip down the river was in the nature of a triumphal journey. The first to salute the Schoonmaker was the steamer John P. Reiss, which happened to be passing the Ecorse yard as she was getting under way. Every steamer that met her did honor to the occasion.

Col. James M. Schoonmaker is in part responsible for the steamer's proportions. Col. Schoonmaker began his commercial life in connection with the river service of the New York Central Lines, which he called "thin water" navigation. Two years ago he made a trip on the Shenango and while watching the maneuvering of one of the big freighters at the Sault he remarked to Mr. Snyder, as a reflection of his own experience, that the great freighters would be more manageable if they had greater beam. There is only one lock at the Sault at present, through which a steamer of greater beam than 58 ft. can pass. Mr. Snyder said nothing, but some time later, meeting Col. Schoonmaker in Pittsburgh, he told him that he had given much thought to his remark and had decided to build a steamer of 4 ft. greater beam than any on the lakes and name her after him. The Schoonmaker is, in fact, of 6 ft. greater beam than the usual type of 600-ft. steamer.

The Schoonmaker is not only the largest bulk freighter on the lakes, but is said to be the largest freighter in the world designed exclusively for carrying freight in bulk. She is 617 ft. over all, 597 ft. keel, 64 ft. beam and 33 ft. deep. She is of arch



OBSERVATION ROOM OF THE SCHOONMAKER TAKEN FROM STARBOARD SIDE LOOKING FORWARD

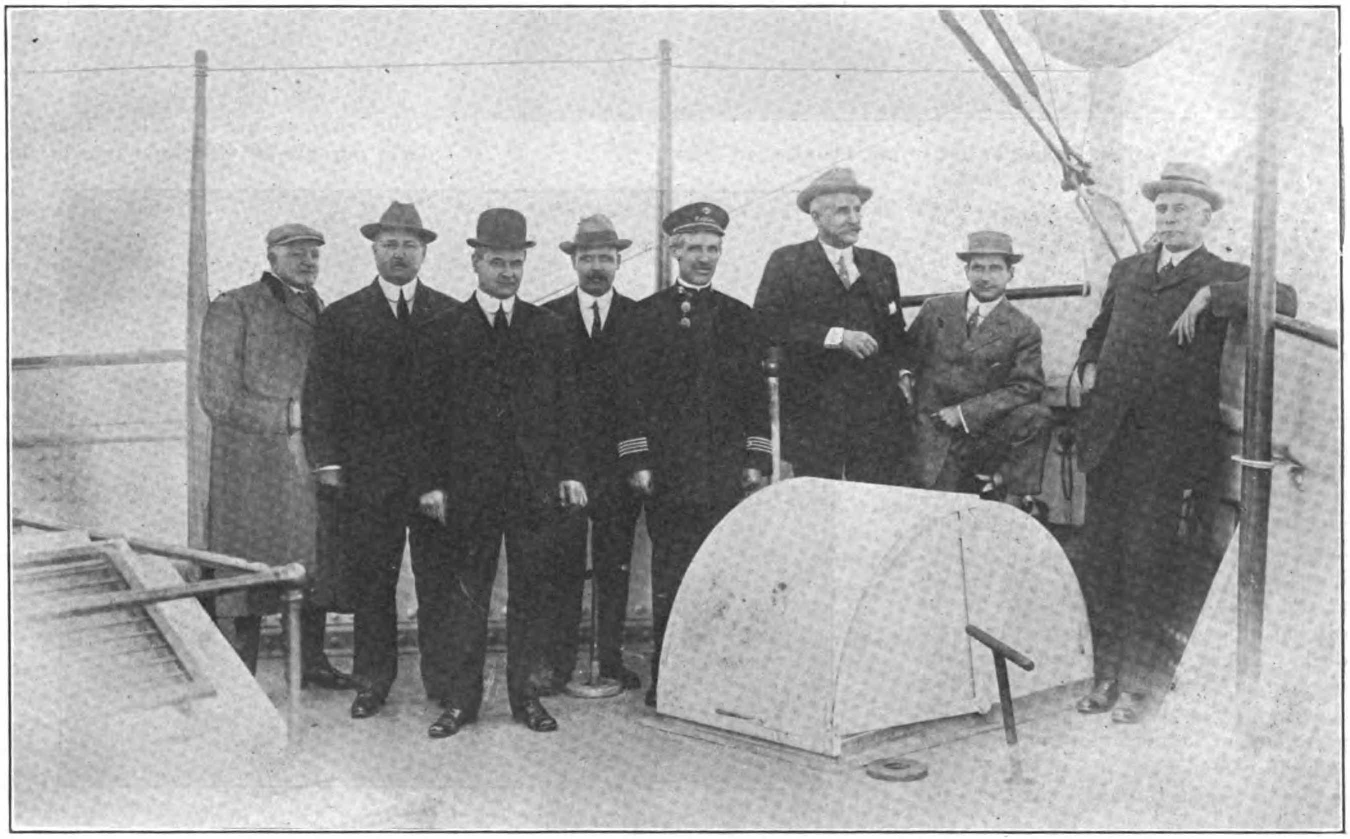
girder construction, her cargo hold being divided into three compartments. Her hopper sides are carried in a pronounced slope from the tank top to the main deck, forming side tanks 12 ft. wide at the bottom and 5 ft. wide at the top. It will be seen that notwithstanding her added beam, her cargo is quite accessible to the unloading machines, owing to the manner in which her side tanks set out from the skin, confining the cargo easily within the sphere of the self-filling bucket and eliminating hand shoveling. The record made in discharging her maiden cargo of ore and appended to this article proves that she is an easy ship to unload.

Water ballast is carried in the side tanks as well as in the water bottom, which is 6 ft. deep, making a total water ballast capacity of 8,000 tons. Her hatches, 35 in number, are 54 ft. wide and 9 ft. fore and aft. The hatch covers, which are of the steel telescopic kind, fitted with Mulholland fasteners are operated by wire cables running through portable tripods on deck and fixed cleats in the butt strap, power being supplied by the deck engines.

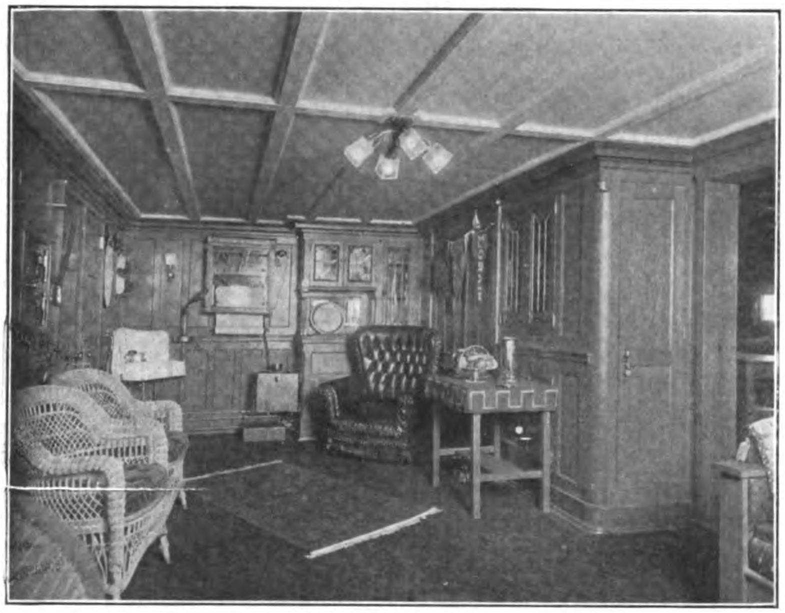
In construction the Schoonmaker is unusually staunch. Two extra longitudinal girders have been fitted on the turn of the bilge in the water bottom to lend added strength. All her deck beams run fore and aft and are 13 in. deep, 4½ in. flange and ⅞ in. thick. All frames are joggled, eliminating liners back of shell plating. Her screen bulkheads are built on the box girder system.

The propelling machinery consists of a quadruple-expansion engine, 23, 33¼, 48 and 69 in. cylinder diameters by 42 in. stroke, the estimated horsepower being 2,600. The high pressure cylinder is placed forward and the first intermediate aft; the low pressure cylinder adjoins the high pressure with the second intermediate installed aft of the low pressure. The high and intermediate cylinders are fitted with piston valves and the low pressure cylinder with a triple-ported slide valve. The high pressure and first intermediate pressure pistons have deep removable followers and the second intermediate and low pressure pistons have the Allen packing rings. All valves are operated with Stevenson link motion, the low pressure and second intermediate being operated by a single rocker arm. Metallic packing of the United States make is fitted on all valve stems and piston rods. The air pump is worked from the low pressure cylinder crosshead. All valves are of ample area and are accessible for quick overhauling. The piston rods are 5½ in. diameter, fitted into annealed steel crossheads having brass shoes both for go ahead and backing. The connecting rods are 9 ft. long between diameters with brass box on top and babbitted cast steel boxes at the lower end.

The crank shaft is of the built-up type with cast steel arms shrunk on. The crank shaft is 12 in. in diameter, supported in four babbitted journals, two 16½ in. and two 20 in. long. The crank pins are 13 in. and 13 in. The thrust bearing is braced to the bed plate and has eight driving collars giving a pressure per sq. in. of 40 lbs. average working pressure. The outboard shaft is 12 in. in diameter, enlarged in the stern bearing to 13½ in. The bearing is 5 ft. long, lined with lignum vitae. The propeller is of the sectional type, 15 ft. 9 in. diameter, with a circumferential pitch of 13 ft. 9 in., at the boss 13 ft., and a developed area of 92 sq. ft. To handle the enormous water ballast capacity of the ship two 18-in. centrifugal pumps of the Kingsford type are provided, direct connected to two 12 x 10 Kingsford enclosed double engines, built by the Kingsford Foundry & Machine Co., Oswego, N. Y., and two Warren, 12 x 16 x 18, reciprocating pumps are located in the



THE PARTY THAT PARTICIPATED IN THE SCHOONMAKER'S MAIDEN TRIP
Reading from left to right: Henry Irvin Jr., J. B. Yohe, C. D. Dyer, W. F. Riley, Capt. Thomas H. Saunders, Col. James M. Schoonmaker, Mr. Morgan and Charles H. McKee



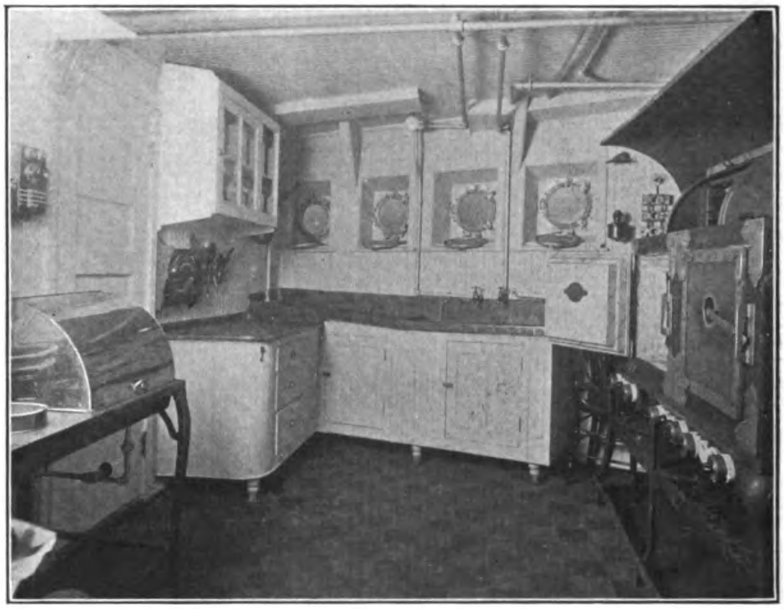
THE CAPTAIN'S QUARTERS LOOKING TO PORT

lower engine room, conveniently connected to the ballast header and so arranged as to pump in and out of side tanks and water bottom, connected complete to each compartment by separate suction and filling pipes of 9 in. diameter. These pipes pass through watertight bulkheads with stuffing boxes. The compartments can be filled or emptied separately or all together by either or both pumps. One valve is put in each ballast pump suction at end of manifold. Two filling valves, 18 in. diameter, are located at the light water line and the pumps discharge overboard above the main deck. There are provided one 8-in. seacock in forepeak, two 6-in. valves between forepeak and forward compartment of double bottom on each side of center keelson, and two 6-in. valves between forepeak and forward compartment of hold. Two 6-in. suctions are provided from after hold to manifold with valves and padlocks for locking. The suction ends of ballast pipes are laid close to center keelson on each side and brass plugs are fitted in all drain and ballast piping at after end.

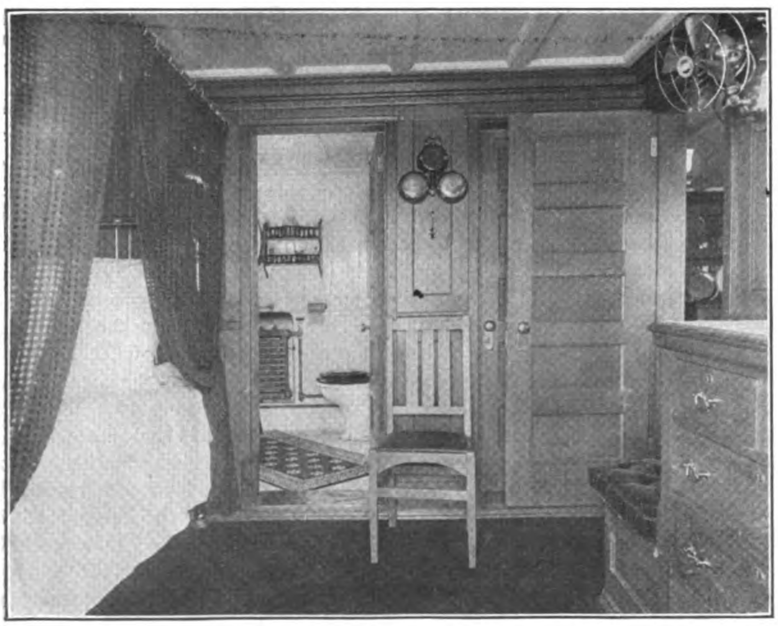
Steam is supplied from three Scotch boilers, 14 ft. 9 in. diameter by 12 ft. 2 in. long, each boiler containing three 44-in. corrugated furnaces and allowed 220 lbs. pressure. The steering gear is in duplicate with two wheel stands in the pilot house forward, with transmission gear of Akers type on each side of the steamer leading aft to two 9 x 9 Hyde steering engines, located on the fantail and connected direct to a cast steel quadrant on the rudder stock.

To handle the mooring cables, six Hyde engines are installed, four on deck, one aft of cabin and one in the windlass room forward. The deck engines, of course, also handle the telescopic hatch covers. There is one Hyde windlass aft on fantail for handling a 3,500 -lb. anchor and one Hyde windlass forward for handling two 4,000-lb. anchors. A feed pump, 14 x 8 x 18; fire pump, 12 x 6 x 14, and two duplex pumps, 6 x 4 x 6, for sanitary purposes are of Warren make, manufactured by the Warren Pump Co. The sanitary system of the Schoonmaker is the most complete on the lakes, the tanks for this purpose holding 50 tons of water.

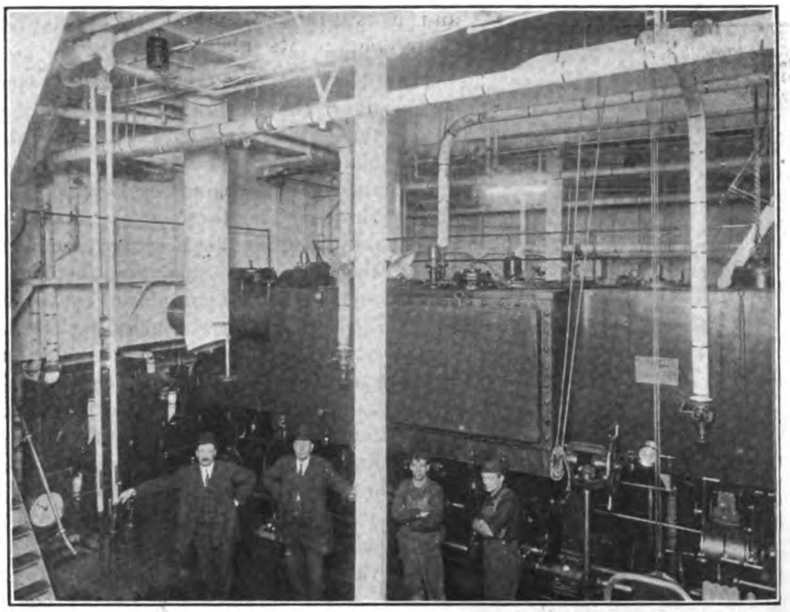
The refrigerating plant consists of one 2½-ton ice machine in the dunnage room forward for the passengers' quarters and one 3½-ton ice machine aft for the crew's stores. These machines were supplied by the Phoenix Ice Machine Co., of Cleveland.



ELECTRIC GALLEY FOR PASSENGERS' GRILL ROOM



ONE OF THE PASSENGERS' STATEROOMS



STARBOARD SIDE OF ENGINE ROOM AT WORKING DECK

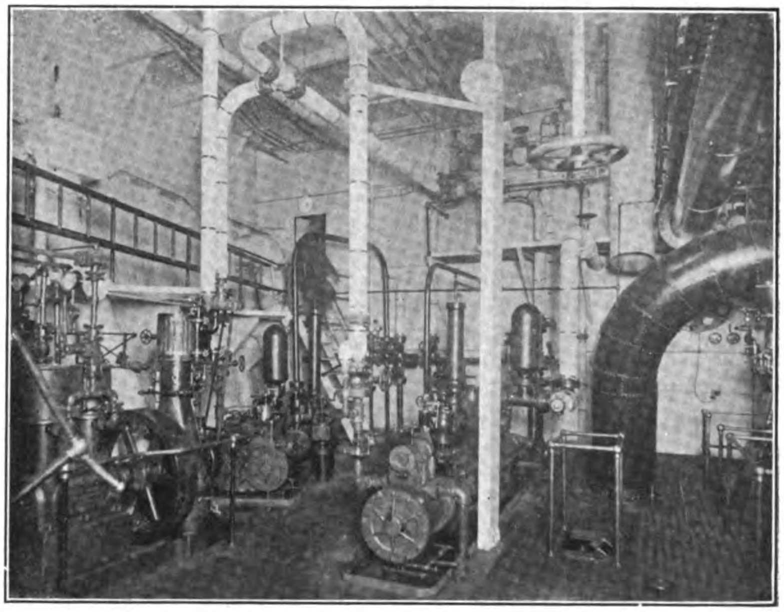
The electrical equipment consists of two 15-k. w. and one 10-k. w. direct connected Crocker-Wheeler generators, driven by American Blower Co. engines, generating sufficient light for 700 16-candlepower incandescent lamps. There are separate circuits for different parts of the ship. The deck is lighted by 24-candlepower lamps carried on poles amidships between hatches. The hold is lighted by two 32-candlepower lights at each hatch. All fixtures below deck are marine type fitted with steam-tight globes.

There does not appear to be an auxiliary making for safety and convenience lacking in this ship. For instance, there is an electric helm indicator, made by the Electric Dynamic Co., Bayonne, N. J., in the wheel house, operated by a rheostat connected to the rudder stock, showing the officer in charge, the position of the rudder at all times; there is in the wheel house also a McNab indicator, a simple little device, showing whether the engine is going forward or astern, in addition to the usual engine telegraph of Great Lakes type; there is an electric whistle device installed by the New York Controlling & Electric Co., to sound signals as they are required as well as to blow them automatically during fog; and an emergency alarm, manufactured by the Schwarze Electric Co., Adrian, Mich., which can be sounded from the pilot house in all departments of the vessel; a telephone service, consisting of independent lines, from the pilot house to the engine room and from the captain's and passengers' quarters to the galley. There is a Schuette recording compass in the captain's quarters, providing an infallible record of everything that occurs in the wheel house at all hours. A wireless telegraph outfit has also been installed by the United States Wireless Telegraph Co. Altogether, the Schoonmaker would appear to have aboard her everything that human ingenuity has so far devised to make navigation safe.

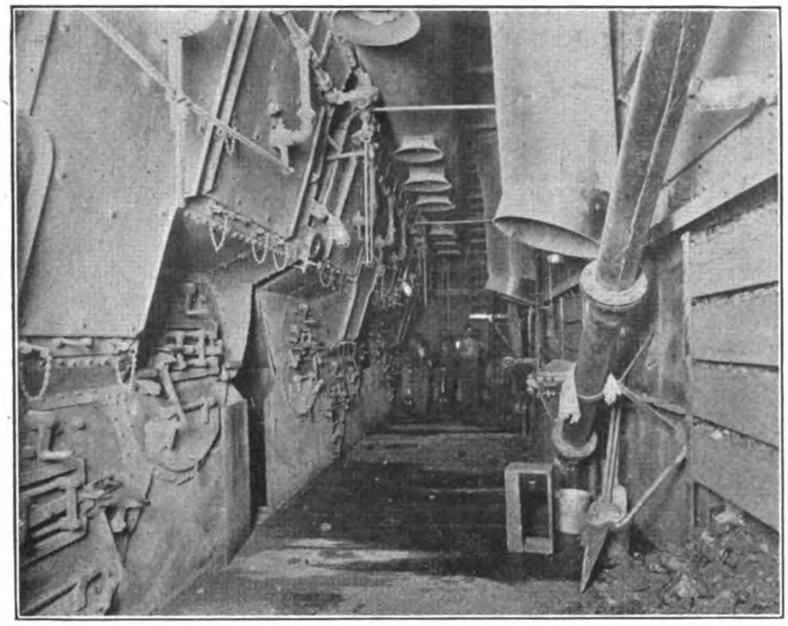
The passenger quarters of the Schoonmaker are unique, distinctive and alone. Since Col. Snyder entered lake trade, he has spared no expense for the comfort and convenience of his guests and he has certainly struck twelve on the Schoonmaker. The entire deck house forward is given over to them. The deck house is divided on the spar deck by a wide corridor leading directly into a grill room which extends the full width of the ship. The effect as one enters the hall is quite impressive, produced not only from the hall itself with its ceiling lights, with its chairs, settees and davenports in fumed oak and Spanish leather, but with the vista that it gives of the grill room, with its tile flooring, tile mantel and electric fireplace. The quarters for the passengers occupy both starboard and port sides of the hall and consist of eight rooms, single and en suite, finished in white enamel, the furniture being of mahogany with the exception of the beds, which are of brass. Each stateroom is provided with private bath and shower. The sanitary features are, in fact, worthy of special mention, as they are the most elaborate that it is possible to build. No expense apparently has been spared in this feature. The bath tubs are of the built-in type of great beauty of workmanship and all plumbing is enclosed. The great hotels have nothing finer and probably not as fine. The showers with Niedicken mixture were installed by the Hoffmann & Billings Mfg. Co., Milwaukee, Wis.

The grill room is most effective with its dull red tile, built-in sideboards and china closets of fumed oak with tables and chairs to match. The grill room being crowded as far forward as possible is lighted by a dome skylight, which pierces the forecastle deck, the tone of the light being in harmony with the decorative scheme.

A stairway leads from the corridor to a small hall on the forecastle deck



PORT SIDE OF ENGINE ROOM, STEAMER SCHOONMAKER, AT WORKING DECK SHOWING MAIN FEED AND FIRE PUMPS AND REFRIGERATING MACHINERY



FIRE ROOM OF THE SCHOONMAKER

from which the observation room is approached. In keeping with the general scheme, the observation room is in fumed oak with Spanish leather and is equipped with writing tables, chairs and a built-in settee of splendid proportions amidships on the after side of the room. A feature of the room is a Victrola finished in wood to harmonize with the furniture.

The owner's quarters are on the port side in rear of the observation room, consisting of one bed room and a bath room with white tile flooring and a shower walled in marble but no tub. The captain's quarters are on the port side aft of the observation room. A stairway leads off the captain's room to a smoking room or lounge which is superimposed upon the observation room. This might be called the passengers' pilot house, as it occupies the space usually employed for the enclosed pilot house on a modern freighter. This will probably prove the most popular room on the ship, especially with the men, as everything in it contributes to comfort and moreover the view from it is superb at all times. Superimposed upon the lounge is the enclosed pilot house with outside railing and compass.

All cooking for the grill room forward is by electricity, the galley being on the main deck beneath the passenger quarters and served by a dumb waiter. The electric stove was supplied by the Thermo Electric Co., of Cleveland, and the steam tables by Weber & Co., of Detroit. The stores are cooled by refrigeration, the ice machine being located in the dunnage room immediately forward of the galley. In this system coils of extra strong pipe are placed in the boxes and liquid anhydrous ammonia evaporated within them at a very low temperature, the ammonia in evaporating taking up the heat. Brine tanks of ample capacity are provided to maintain an equality of temperature when the plant is not running. The system also provides for making ice for table use in suitable size molds.

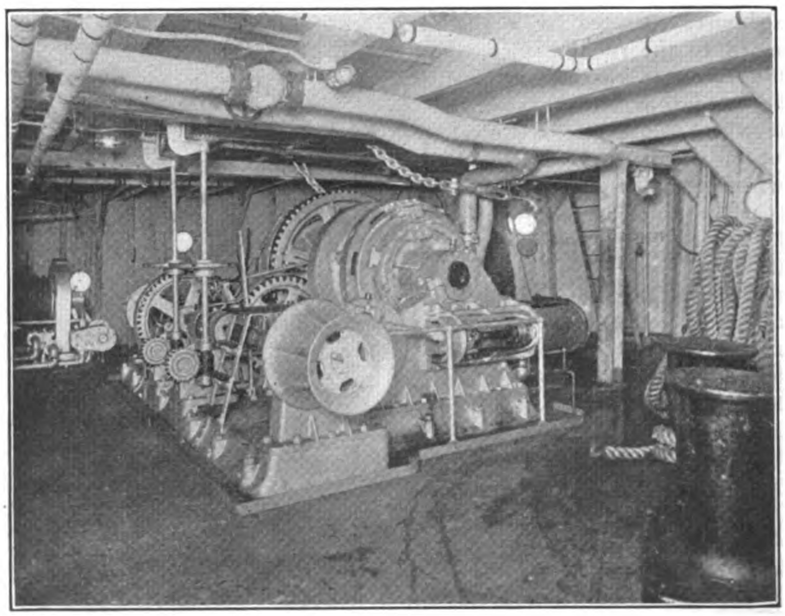
The dunnage room also contains one of the sanitary pumps. This room is a thing of joy to an orderly mate, so different from the old-style dunnage room. Extending the full width of the ship, it is spacious, light and airy, with a place for everything and it is to be observed that everything was in its place.

Unusual thought has been expended upon the design of the crew's quarters. The first and second mate are housed on the forecastle deck aft of the owner's quarters, with a joint shower. The forward crew are housed on the main deck directly underneath the passenger quarters and are supplied with all modern conveniences. The after crew, including the deck hands, are all provided with ample quarters on the spar deck aft, each room being provided with an electric fan. In fact, every room on the boat has a fan in it. The sanitary arrangements aft are as complete as they are forward, there being showers and baths in each department with private bath for the chief and first and second engineers. A drying room is also provided after the boilers, where wet garments may be dried in a few minutes.

The after end of the deck house aft is given over to the private dining room for passengers and the crew's dining room, the private dining room being on the starboard side and the crew's dining room on the port side. The private dining room is decorated in fumed oak and the crew's dining room in light oak, and it is a mere question of taste as to which is more attractive.

Capt. Thomas H. Saunders, who brought out the Schoonmaker, says that she is the easiest vessel in a seaway that he has ever sailed, being unusually responsive and manageable, due undoubtedly to her greater beam.

The Schoonmaker took 12,650 tons of coal from Toledo to Sheboygan,



WINDLASS ROOM OF THE SCHOONMAKER

Oct. 10, on her first trip, carrying 338 tons of fuel as well. She was drawing 18 ft. 5 in. forward and 18 ft. 7 in. aft. Stages of water are low this year and no attempt will be made to get a record cargo until next spring, when draught is likely to be more favorable. She carried her maiden cargo of ore from Duluth to Ashtabula, making the run in the fast time of 76 hours. She had 10,799 tons aboard in actual weight. No effort was made to unload her in record time, but nevertheless the performance was very creditable. She went under the four Hulett electrics at the Union dock at 12:30 p. m., Oct. 21, and finished at 5:45 p. m. The details follow:

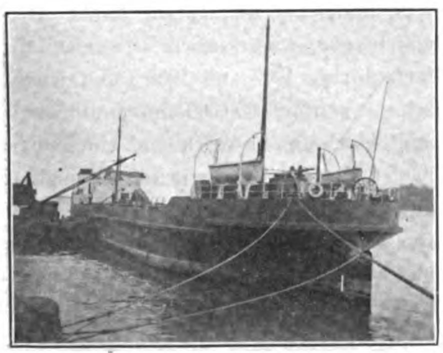
Commenced unloading	12:30 p. m.
Finished unloading	5:45 p. m.
Gross time unloading	5 hrs. 15 min.
Lost time	6 min.
Net time	5 hrs. 9 min.
Average number of tons unloaded per hour	2,097
Maximum amount unloaded by one machine in one hour	776
Total tons unloaded	10,799

It must be understood that the Schoonmaker will not be able to avail herself of her great carrying capacity on the Lake Superior route until the third lock at the Sault, now under construction, is completed, as the mean depth of the Poe lock is somewhat below that of the Canadian lock, through which she cannot pass. On the Lake Michigan run to South Chicago she could probably carry 15,000 gross tons.

The Toiler

Editor MARINE REVIEW:—The advent on the lakes of the Diesel oil engine propelled Toiler, after successfully negotiating a particularly stormy Atlantic crossing, marks an important epoch in marine propulsion and brings sensibly nearer the adoption of internal combustion engines in lake shipping.

As with every other innovation, the Toiler is likely to be followed by a profuse crop of ill-advised imitations by owners and builders all too ready to introduce freak forms of propulsion under conditions in which they are quite inapplicable.



THE TOILER AT MONTREAL, LOOKING FORWARD

While there is no sphere as suitable as the lakes for the rapid introduction of internal combustion engines, a few lessons may be derived from experience with the Toiler which, if taken to heart, may avoid many costly failures.

THE TOILER LOOKING FORWARD

In the first place, it should always be remembered that whatever economy to be obtained by internal combustion engines in marine propulsion, oil as fuel is so much more expensive than coal that any wastefulness in its use reduces to the vanishing point the economy in fuel to be obtained by the oil engine. Again, the Diesel engine for successful results must inevitably run at a comparatively high rate of revolution. It does not appear that less than 150 per minute can be arranged for and 250 is much more usual. With such high revolutions a radical change is necessary in the propeller used, and if there is one thing in the lake boat which is the result of the most careful study and experience of local conditions it is the propeller. To dispense with the big, coarse-pitch backing-wheel universally in use in full forms of lake craft, would be a serious matter, and the Diesel engine will simply not swing it. It should not be forgotten also that the Diesel engine is a much more elaborate and accurate piece of workmanship than the average steam engine. It is necessarily so being built for pressures unheard of in steam practice, and the standard of workmanship and material necessary much more nearly resembles gun work than ordinary marine engineering. Then the question of the drive of auxiliaries is a serious one. Without steam on board a special power generating arrangement must be fitted for the steering gear, windlass, pumps, winches, etc. Manifestly in a big freighter this would be quite a serious item. Compressed air, as in the Toiler, would be quite impossible, being wasteful and inefficient. Electricity seems to offer better prospects of success, but even with that method of transmission a great advance has to be made in the present types of electrical steering gear and auxiliaries before perfect safety and reliability could be counted upon.

With these conditions carefully in view, it is probable that the best solution will be found by fitting a multiple unit system of Diesel engines for power generation with electric or other forms of transmission as advocated by Maver, Parsons and others to the propeller and the auxiliaries.

JOHN REID.

Montreal, Oct. 23.

Steel Corporation's Depot at San Francisco

The United States Steel Products Co., a subsidiary of the United States Steel Corporation, in furtherance of its plan to establish a great depot in San Francisco, has had plans prepared for new docks on the Risdon Iron Works property at the foot of Twentieth and Twenty-second streets. Howard C. Holmes, consulting engineer, drew up the plans, and the contract for the work is to be awarded to the Thompson Bridge Co. The cost will be about $60,000 and construction will be begun as soon as piles can be obtained from the creosoting company.

Two docks, one 384 x 90 feet and the other 300 x 48 feet, will be built close together, according to the plans, which aim primarily to replace the old Risdon Iron Works docks, now in a state of decay. A trestle over a curb will afford the approach to the new docks, making it possible to load steel direct from cars to ships or vice versa.

The Racine Boat Building Co., Racine, Wis., is building the government launch Patrol for the government engineer at Duluth. The contract price is $13,950. The Patrol was designed by J. Murray Watts, 328 Chestnut street, Philadelphia, Pa.

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November, 1911

The French Revolution of Industry

In the French Revolution now prevailing in the industrial world, many things have happened since the last issue of THE REVIEW vitally affecting the trade of the lakes. The United States Steel Corporation, the most benign of all combinations of capital, and undoubtedly the most useful and helpful as a steadying influence, has been asked by the government to dissolve in a brief that is simply a marvel of technical irregularity. No more important action of a civil character has ever been begun by the United States government. It involves a capital that is larger than our national debt; it involves a wage schedule of $500,000,000 per annum, affecting the well-being of a vast army of men. No action more potential in the creation of widespread misery could be conceived. In our opinion the action of the government is untimely and unwarranted. Business conditions are in a highly nervous state and this action merely serves to make them more so. There has been nothing in the conduct of the affairs of the Steel Corporation to warrant the attack. It has at all times manifested not only a disposition but an eagerness to meet the wishes of the government. The Steel Corporation is not a corporation organized in restraint of trade. It lacks both the intention and inclination to crush out competition; on the contrary it has aided its competitors and has always met them in a spirit of helpfulness. Since it was organized independent producing capacity has increased in greater ratio than the Corporation's producing capacity, notwithstanding the addition of such splendid plants as Gary. Moreover, it has advocated and practiced publicity in all its doings. The records of the Steel Corporation are an open book. It has no secrets in the trade or out of it and the country has been the better off for its ten years of life.

There doubtless have been trusts that have crushed out competition by unfair methods, but is is unfair to include the Steel Corporation in that category. But as long as the suit has been begun let it be quickly ended. The Corporation is naturally anxious to have an early decision and will file its formal answer to the government's petition not later than Jan. 2 next.

The United States Steel Corporation has given notice of its intention to surrender its lease upon the Hill ore lands on Jan. 1, 1915. The trade had evidently overlooked the fact that the lease contained this provision because the announcement of the cancellation was a surprise in many quarters. At the time the lease was formed in 1906 there were many who did not regard it as a particularly favorable arrangement for the Corporation owing to the ascending royalty scale and the further provision that any reduction in the rail rate would have to be added to the royalty. Briefly, the lease provided for a minimum output of 750,000 tons of ore in 1907 at 85 cents royalty. The minimum was to increase at the rate of 750,000 tons per annum until the annual production reached 8,250,000 tons, which it would do in 1917, and was to be maintained at that figure until the deposits were exhausted, the royalty meanwhile increasing each year at 3.4 cents a ton, or 4 per cent on the original rate of 85 cents. This arrangement, if continued until 1950, would have worked out at a royalty of $5 a ton upon every ton of pig iron produced from these ores. It is probable that the directors of the Steel Corporation were not a unit in making this lease. It appears to have been a very favorable one throughout for the Great Northern railway. The lease did not include the mines that were actually shipping at the time that the lease was made, but merely the lands upon which ore was known to exist. In fact, during 1907 and 1908 the Corporation spent $3,000,000 in exploration and development work and since then has undoubtedly spent an equivalent amount. The determination to cancel the lease was not a sudden one. It has been under consideration for nearly a year.

The freight rate on ore on the two iron range railroads owned by the United States Steel Corporation,—the

Duluth & Iron Range railway and the Duluth, Missabe & Northern railway, —will be reduced to a flat rate of 60 cents a gross ton, effective Nov. 30, 1911. The present rate is 80 cents a ton on all Mesabi range points to Duluth and Two Harbors and varies from 90 cents to $1 per ton from points on the Vermillion range, being 90 cents from Tower and $1 from Ely. The saving, therefore, ranges from 25 to 40 per cent and means, of course, a conisderable saving on the cost of the ore. The new tariffs have been filed with the Interstate Commerce Commission, having been under consideration by the directors of the Steel Corporation for some time. What effect this reduction will have upon the price of ore for 1912 remains to be seen, but it is quite likely, of course, to be reduced.

Independent Vessel Merger

During the past month a number of independent lake vessel owners have met to consider plans for a merger of the independent vessels. In a casual way the subject has been in mind for more than a year, but the present season has brought acutely home to all of them the necessity for some such action. There are altogether too many vessels on the lakes for the business that is offering, and the experience of the year has been that only a few in each fleet have found employment. If they were all to enter one company, only such as would actually be required to care for the business would be fitted out. Moreover, with a resourceful, independent fleet capable of meeting every requirement as it arose, a number of the lesser mills and furnaces which have made a practice in late years of building vessels to move their own ore for consumption, might be persuaded that the independent fleet could move it more cheaply and quickly.

There are naturally numerous obstacles in the way of such a merger and at the present moment everything is of the most indefinite character. For instance, there would have to be an elimination of individuals, which is not pleasant for the individual selected for elimination to experience or even contemplate; there is also the question of fleets that are free from debt and fleets that have bonded obligations to meet; and there is also the case of the fleet that has reasonable assurance of continuing contracts either of coal or ore through trade connections or personal influence. Independent vessel owners realize, however, that something must be done, and probably some working plan will be thought out before navigation opens in 1912. The future of lake trade cannot be governed by the past and anyone who looks to the past for his guidance will be deceived. The independent vessel owner is face to face with a new condition. Not only is he confronted with a surplus of tonnage, but he is also confronted with the fact that those who have the commodities to move have also, in fair degree, the ships in which to move them. His salvation lies in showing that he can move the commodity more efficiently and more economically. Both these ends could probably be achieved if the independent fleet could be molded into one harmonious body.

Commonwealth Troubles

The further developments into the various troubles of the Commonwealth Steamship Co. include a suit in the United States circuit court against the American Ship Building Co., of Cleveland, to recover $60,000 which is alleged to have been an overcharge on the steamer built in 1906 for the Minerva Steamship Co., later merged into the Commonwealth Co. The Minerva Steamship Co. was organized by Henry A. Hawgood, now deceased, and the steamer in litigation was named after him. The petition represents that the late Mr. Hawgood received $35,000 in commission on this steamer and that the Minerva Steamship Co. paid altogether $60,000 more than the market rate prevailing for steamers of her type at the time that she was built. The Henry. A. Hawgood cost $420,000.

A suit involving the same action was also begun in common pleas court against the trustees of the estate of Henry A. Hawgood to recover $60,000, the petition setting forth the same incidents as related above. A suit has also been started in common pleas court against the American Ship Building Co. to compel it to produce its books in relation to three steamers of the Commonwealth Steamship Co., namely, the W. R. Woodford, A. H. Hawgood and W. A. Hawgood.

The insurance firm of Willcox, Peck & Hughes has filed suit against the Commonwealth Steamship Co for $20,690.17 for premiums due on the vessels of its fleet for the year 1910. Notes were given by the Hawgoods for these premiums and have been renewed from time to time. The suit is being contested by the Commonwealth Steamship Co. on the ground that the Hawgoods were not authorized to give notes to the insurance company for these premiums, claiming that the notes so given included a commission to be paid to the Hawgoods. Altogether the legal tangle appears to be growing more complicated every day.

Commerce of Lake Superior

The commerce of Lake Superior totalled 7.921,572 tons during October, a decrease of only 28,272 tons from the September movement, when 7,949,844 tons were moved. The movement to Nov. 1 totalled 47,359,739 tons as against 56,705,967 tons for the corresponding period last year, a decrease of 9,346,228 tons. The summary follows:

East Bound.

	To Nov. 1, 1910.	To Nov. 1, 1911.
Copper, net tons	115,373	104,444
Grain, oth. than wheat, bu.	29,849,662	27,021,695
Building stone, net tons.	9,485	4,367
Flour, barrels	6,114,481	5,944,766
Iron ore, net tons	39,006,737	28,227,583
Pig iron, net tons	31,728	32,905
Lumber, M. ft. B. M.	544,886	485,876
Wheat, bushels	62,296,174	60,929,021
Unclassified freight, net tons	142,455	121,349
Passengers, number	30,955	36,904

West Bound.

	To Nov. 1, 1910.	To Nov. 1, 1911.
Coal, anthracite, net tons	1,411,345	1,769,567
Coal, bituminous, net tons	10,549,041	11,894,878
Flour, barrels	[illegible]	[illegible]
Grain, bushels	2,153	1,350
Manufactured iron, net tons	328,253	320,314
Iron ore, net tons	3,248	15,758
Salt, barrels,	483,529	550,778
Unclassified freight, net tons	1,053,708	1,046,575
Passengers, number	33,944	41,042

Summary of Total Movement.

	To Nov. 1, 1910.	To Nov. 1, 1911.
East bound, net tons	43,288,425	32,230,708
West bound, net tons	13,417,542	15,129,031
Total	56,705,967	47,359,739

The total number of passages to November, 1911, was 16,406 and the net registered tonnage, 37,134,953.

H. S. Wilkinson, manager of the Great Lakes Steamship Co., has been elected a director of the Crucible Steel Co. of America.

Howard M. Hanna Jr. has been admitted into membership of the firm of M. A. Hanna & Co., Cleveland.

THE WESTINGHOUSE MARINE TURBINE REDUCTION GEAR

UNTIL recently, there have been but few attempts to construct gearing for the transmission of large powers at unusually high tooth speeds. The importance of a system of noiseless gearing to be interposed between a high speed turbine and the screw shaft of a vessel, involving the transmission of many thousands of horsepower, has made the attainment of this object an exceedingly attractive field of investigation.

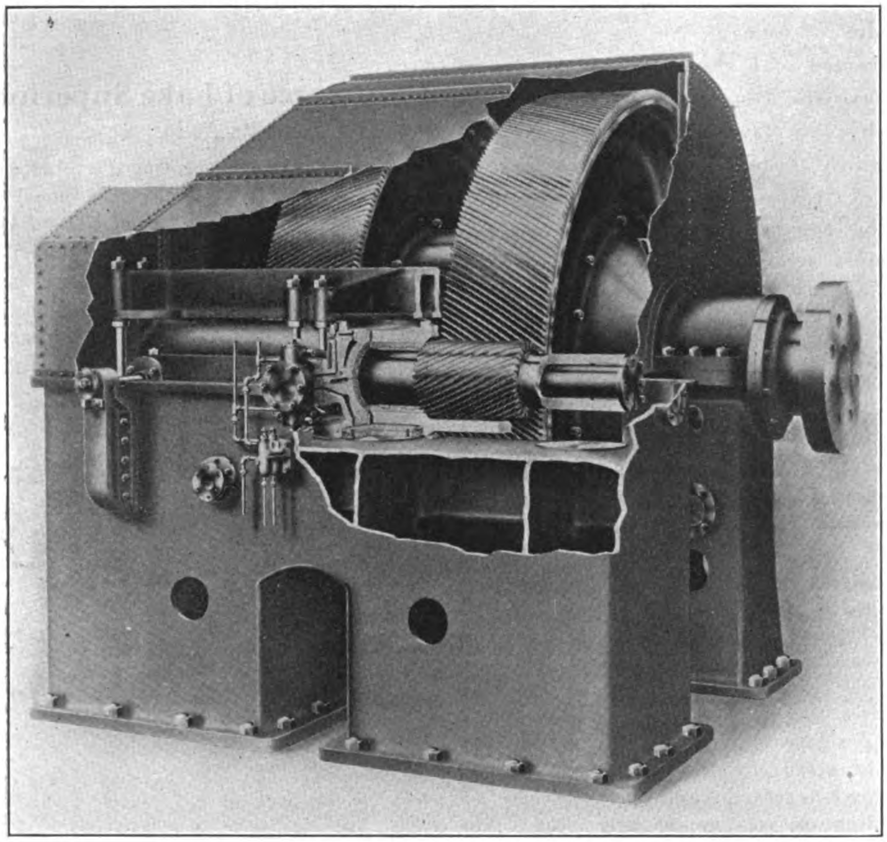


FIG. 1—PERSPECTIVE VIEW OF GEAR INSTALLED ON COLLIER NEPTUNE

The most serious problem confronting the designer of such a system of gearing has been the development of a mechanism to insure an elastic, uniformly distributed tooth pressure between gear and pinion to avoid the concentration of an excessive tooth pressure at any single point of the working face, which would result in rapid deterioration and ultimate destruction of the teeth. This problem —which is by no means an easy one —has been effectively and interestingly solved in the Westinghouse marine turbine reduction gear.

Fig. 1 is a perspective view—partly in section—of one of the gears installed on the U. S. S. Neptune. Each gear transmits approximately 4,000 h. p. at a speed of 1,250 r. p. m. for the pinion shaft, and about 130 r. p. m. for the low-speed or driven shaft. Naturally, double helical gears are used on account of the quiet running qualities of this type, and the fact that the opposing helices automatically balance the end thrust.

The low speed gear shaft rests on bearings seated in the main casing, and up to this point the design is fairly conventional.

The essential and distinctively novel feature of the design is the hydraulically supported frame which carries the pinion shaft and its bearings, and by virtue of which the pinion shaft is self-aligning, responding instantly to the smallest unbalancing of the tooth pressure.

This method of suspending the pinion bearing frame not only insures the most perfect balancing of tooth pressures, but the fluid cushion interposed between the pinion shaft and the main casing of the gear silences in a large measure the noise usually associated with the operation of high speed toothed gearing, and prevents all shock or jar from the rapid contacting of the teeth. After a considerable period of operation, the gear teeth take on an excellent polish and show no signs of pitting or other deterioration that usually accompanies hard and continuous service.

The action of this hydraulically supported frame may be more easily understood by first inspecting Fig. 2, which is a purely diagrammatic section stripped of all mechanical detail that might be confusing, and which illustrates the simple elemental principles of the design. Fully elaborated detail sections are shown in Figs. 3 and 4, and the symbols used in the description refer to the same parts in all of the illustrations.

Referring then to Fig. 2, *A* represents the frame carrying the bearings of the pinion shaft, *D* is a portion of the main casing, and *E* is a rigid strut or beam secured to the main casing by means of a series of steel columns which are shown in Figs. 1 and 3. It will be noted that *A* does not fit closely between the parallel faces of *D* and *E*, but has freedom for a slight upward and downward movement.

On the upper and lower surfaces of *A*, are three circular pads bored out to form shallow cylinders in which are fitted short pistons, *C*. *1* indicates a passage or port, which communicates with the three shallow cylinders on the lower side of the frame *A*, and *2* indicates a similar port communicating with the corresponding cylinders on the top side of *A*.

When the gear is working, the reaction on the pinion teeth will tend to force the frame *A* against the casing *D* or the beam *E*, depending on the direction of rotation. If the reaction on the pinion teeth tends to force the frame *A* downwards against *D*, then if oil or other suitable fluid under sufficient pressure be introduced at *1*, it will be readily seen that the frame *A* will be lifted clear of the casing, and will actually float on the fluid in the cylinders. Similarly, if the direction of rotation be reversed so that the tendency is to force the frame *A* against the beam *E*, the introduction of fluid under pressure at *2*, will prevent the frame *A* from coming in actual metallic contact with

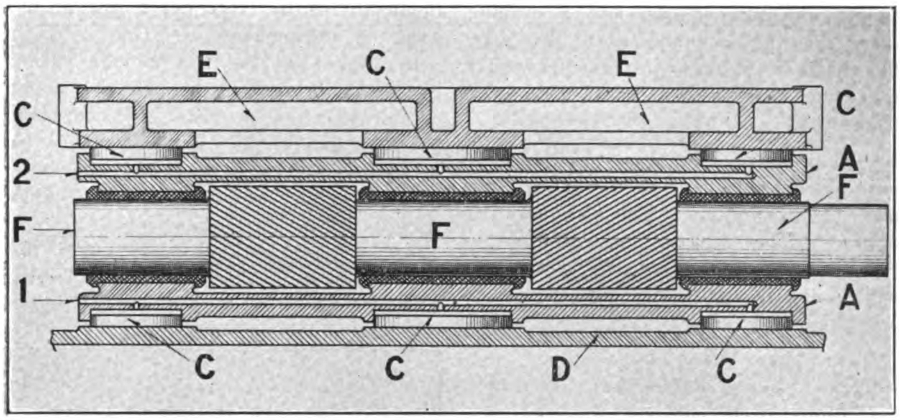


FIG. 2—DIAGRAMMATIC SECTION ILLUSTRATING SIMPLE PRINCIPLES OF THE DESIGN

E. Since all three cylinders of the set that may be in action are connected to the same source of fluid supply, the slightest difference in tooth pressure on either side of the middle point of the pinion shaft *F* will cause the frame *A* to yield at the point where the pressure is unduly high. In thus yielding, the excess pressure is relieved, and automatically transferred to the point in the working face of the pinion at which the tooth pressure was, at the instant, below normal.

The broad underlying principle of the design is, therefore, the supporting of the pinion shaft in a frame which literally floats on oil, and which has no metallic or other rigid connection to the main casing. The practical application of this principle involves the accurate and automatic regulation of the fluid pressure in accordance with the load on the gear. The means by which this is accomplished will be understood from a study of the actual detail sections, Figs. 3 and 4.

Fig. 3 is a section through the floating frame at the middle bearing. The frame is split in a horizontal plane for convenience in removing or inserting the shaft and bearings. *1* and *2* are the longitudinal oil passages communicating with the supporting cylinders, and *6* is a duct which conveys lubricating oil at low pressure throughout the length of the pinion frame and distributes it by means of side outlets, to the bearings, and to the pinions. *B* is an arm which projects into the valve box *G*, and which contains passages communicating with *1* and *2*. *H* is a link which hinges the frame *A* to the casing *D* so that the slight vertical motion of the frame is multiplied at the end of the arm *B*, which controls the oil valves.

For many years it has been known in a general way that if oil be fed to a rotating journal at the point of minimum pressure, it will be carried by the journal to the point of maximum pressure, and if a means of egress is provided the oil may be discharged against a pressure substantially equal to the maximum bearing pressure. Heretofore, practically nothing has been known, however, regarding the quantity of oil that might be pumped through a properly designed bearing.

In the development of this gear, it was found that by suitably proportioning the bearings and supporting pistons, the former could pump all of the oil required for floating the pinion frame.

Referring to the section through the bearing, as shown in Fig. 3, it will be seen that there are small passages connecting the top and bottom of the bearing with the upper and lower cylinders, respectively. The bearings draw in oil from the lubricating system, and discharge it through the check valves *L* into the supporting cylinders, and were it not for the automatic regulating mechanism in the valve box *G*, would build up a pressure considerably greater than is required to keep the pinion bearing frame floating in its normal position.

Fig. 4 is a cross section on a larger scale through the valve box *G*. If the direction of rotation of the pinion is such as to bring the lower set of balancing cylinders in action, the excess pressure will tend to raise the arm *B* slightly, and as the ring valve *N* cannot follow it on account of coming up against a shoulder, the surplus oil will escape into the valve box.

Referring back to Fig. 3, *J* is a floating packing which prevents the over-flow oil from spilling directly back into the main casing, and compels it to run off through the drain pipe *K*. This pipe discharges into an open funnel, and the constant over-flow of oil is an unfailing indication that the gear is functioning properly. From this funnel the oil may be returned to the main casing to be circulated again through the lubricating system.

When starting, it may be desirable, though not absolutely necessary, to supply the oil to the supporting cylinders from an outside pressure source, until the gear attains the normal speed, and the pumping action of the bearings is fully established.

In Fig. 4, oil from such an outside source of pressure may be introduced at *3* and led to the upper and lower valves, as indicated. If the direction of rotation of the pinion is such as to

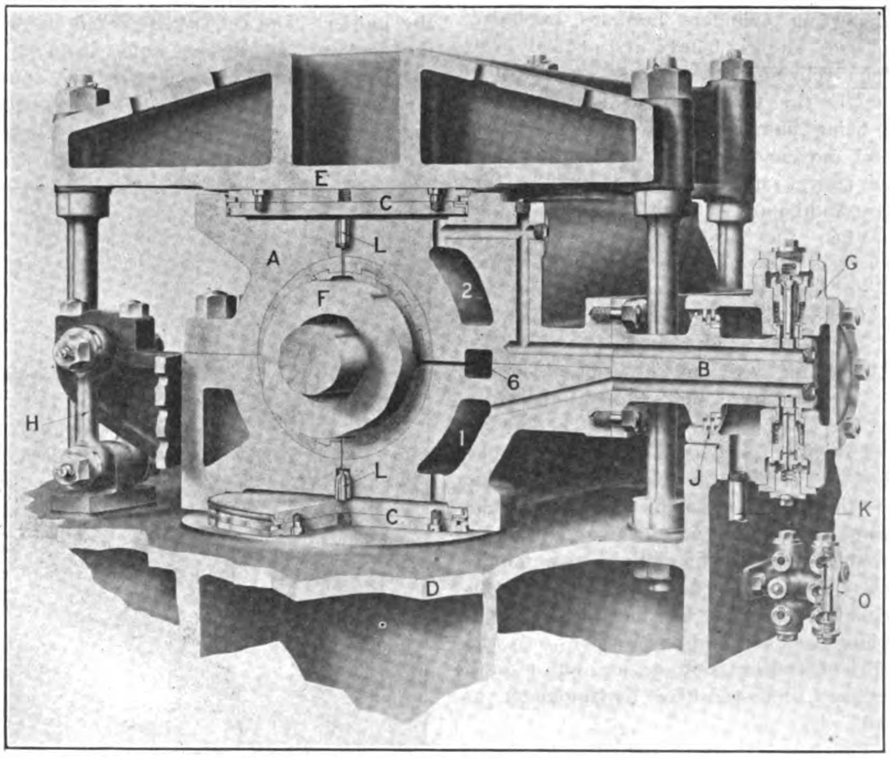


FIG. 3—SECTION THROUGH THE FLOATING FRAME AT THE MIDDLE BEARING

depress the frame, the arm *B* depresses the ring valve *N*, and the conical valve *M*, pushing the latter from its seat. The stem of the valve *M* is hollow, as shown in the section through the upper valve. When the valve *M* is opened, the oil passes through the hollow stem, as is clearly shown, into the lower circular port in *B*, and thence to the passage *1* (Fig. 3), which connects with the lower set of cylinders, and

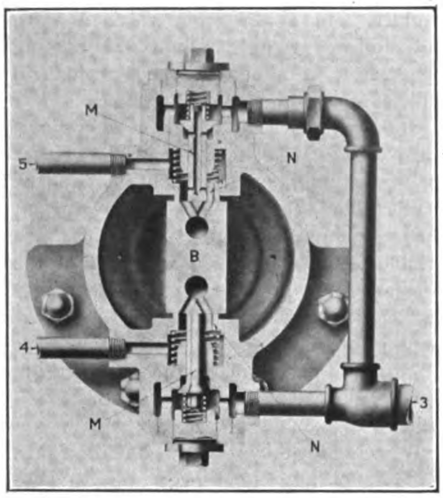


FIG. 4—CROSS SECTION ON A LARGE SCALE THROUGH VALVE BOX G

is prevented by the check valves *L* from escaping into the bearings. When the balancing pressure has been attained, *B* rises to its neutral position, allowing *M* to seat and prevent further entrance of oil. If, by reason of a reduction of the load, the oil pressure in the supporting cylinders becomes excessive, *B* rises slightly above its neutral position, relieving the excess pressure in exactly the same way as when the oil is being pumped by the bearings. The total movement of *B* for adjusting over the entire range of load is only a few thousandths of an inch.

When the direction of rotation is reversed, the operation is just the same, except that the necessary functions are performed by the upper valves instead of the lower ones.

From the foregoing description, it will be readily seen that the oil pressure in the supporting cylinders is always exactly in proportion to the torque that is being transmitted. By virtue of this fact, a simple pressure gage connected inside of the valve *M* will, if the speed in revolutions per minute be known, indicate the instantaneous load on the gear, so that the Westinghouse reduction gear is not only an efficient transmission device, but a most accurate and sensitive dynamometer as well.

The connections to the pressure gages are indicated at *4* and *5* (Fig. 4). If recording gages are used instead of simple indicating gages, and a graphic speed recorder is connected to the gear, the charts from these instruments would constitute a continuous log of the power transmitted.

The pressure gages may be located in any convenient position, and as far away from the gear itself as may be desired. The direction of rotation is always evident from an observation of which of the two gages is indicating pressure at the time.

If the gages were placed at any considerable height above the gear, their indications would have to be corrected for the hydrostatic head of the oil column. Furthermore, if the gages were located at a great distance from the gear, there might be some annoyance from leakage, solidification or air pockets in the oil piping. For long distance indications, an ingenious little device has been worked out, which translates the oil pressure to a compressed air supply, which may be conducted to the pressure gages wherever they may be located. This translating device is indicated by *O* (Fig. 3).

Fig. 5, a section through the floating frame and pinion, illustrates the simple way in which the lubrication of the gear teeth is accomplished. The frame encloses the pinion except for a portion of the circumference where the teeth engage with those of the large gear. From the passage *6*, lubricating oil passes to the pocket in which the pinion is located. The shape of this pocket is such that the oil cannot run out, but must be picked up by the teeth of the pinion. The oil, when picked up by the pinion, is thrown off again by centrifugal force, but owing to the construction of the frame, it can escape only by being discharged directly into the teeth of the large gears just at the point of engagement.

In Fig. 1 at the left of the casing is shown a bracket, through the upper end of which is a screw adjusted strut bearing against the pinion frame. A similar bracket and strut—not shown in the illustration—are located at the other end of the casing. These struts are for adjusting and maintaining constant the depth of engagement of the gear teeth. They do not interfere with the movement of the pinion frame in a vertical plane.

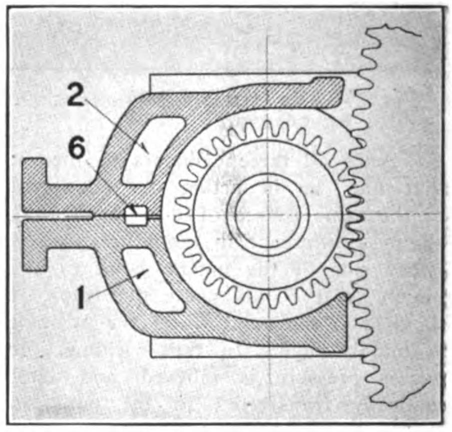


FIG. 5—SECTION THROUGH FLOATING FRAME AND PINION

In order to obtain a flexible drive between the turbine and the gear, and at the same time to keep this gear in close proximity to the turbine, the pinion shaft is made hollow, and the driving shaft passes freely through this bore and is connected to the pinion shaft at the end farthest away from the turbine. This is an old and fairly well known construction, which has been incorporated on account of its making the apparatus more compact, and not

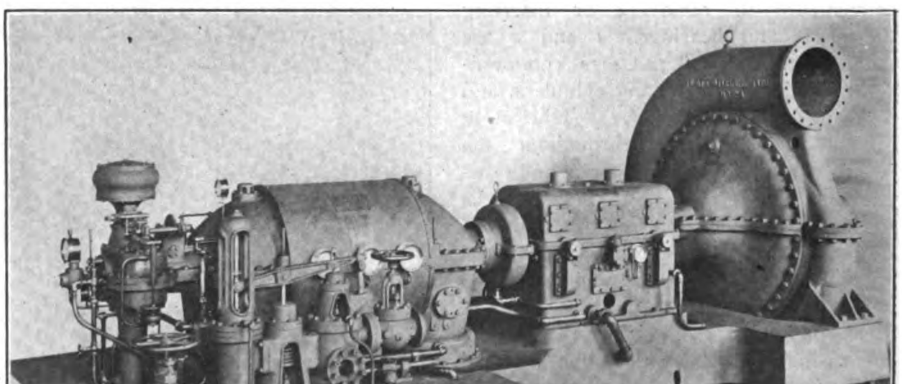


FIG. 7—ILLUSTRATING ITS APPLICATION TO CENTRIFUGAL PUMP

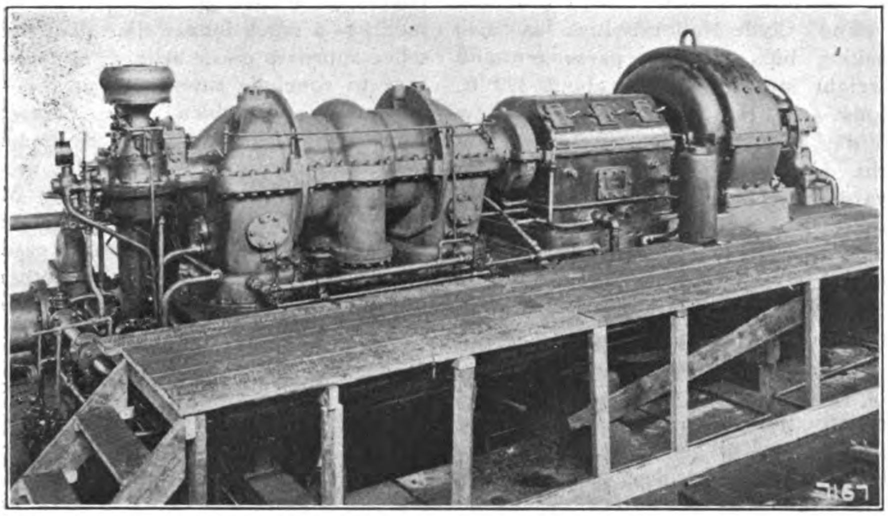


FIG. 6—ILLUSTRATING ITS APPLICATION TO DIRECT-CURRENT GENERATOR

because any novelty is claimed for it.

While the Westinghouse reduction gear was originally designed for marine propulsion, in order to harmonize the high speed which is the essential characteristic of an efficient steam turbine, with the comparatively moderate limiting speed for an efficient propeller, its adaptability for other purposes is opening up a field even broader than the one primarily contemplated.

The design of direct current dynamos of fairly large capacities, to operate at the high rotative speeds necessary for direct connection to efficient steam turbines, has always presented difficulties that were seemingly unsurmountable. These difficulties have all been eliminated by interposing the reduction gear between the turbine and the dynamo, so that each element of the combination may operate at the speed for which it is best adapted.

Similarly, centrifugal pumps for large capacities at moderate heads are not at all suitable for direct turbine drive, but turbine and pump may be connected through the reduction gear constituting a highly efficient and attractive unit.

Naturally, for this sort of service in which the direction of rotation is never reversed, only one set of balancing cylinders and regulating valves is required.

Figs. 6 and 7 illustrate applications to direct current generators and centrifugal pumps. These are only two out of a large number of new opportunities for the steam turbine that will present themselves as soon as it is realized that the handicap of inherent high rotative speed can be removed by a thoroughly reliable and durable system of gearing having an efficiency of over 98½ per cent, and that such a system is now an accomplished fact.

In addition to the two 4,000-h. p. gears installed on the U. S. S. Neptune, 12 1,000-h. p. and 2,000-h. p. sets have been sold for driving direct current generators and for other purposes. A number of these have already been in service for some months, running at speeds as high as 3,600 r. p. m., with results that are most gratifying in every particular.

Lake Ship Building

The American Ship Building Co. closed a contract on Nov. 2 for the construction of a steamer to be fitted with conveying machinery for unloading, similar in design to the Alpena and Wyandotte. She is intended for the crushed stone trade and will be capable of discharging her own cargo. She will be larger than either the Alpena or Wyandotte, being 436 ft. over all, 416 ft. keel, 54 ft. beam and 29 ft. deep. Her engines will be quadruple expansion, 19, 27½, 40 and 58 in. cylinder diameters by 42-in. stroke, supplied with steam from three Scotch boilers, 11½ ft. in diameter and 11½ ft. long, fitted with Howden draft and allowed 210 lb. pressure. The conveying apparatus for unloading will be built by the Stephens-Adamson Mfg. Co., Aurora, Ill. The name of the company ordering the steamer is withheld. The steamer will be built at Detroit.

The American Ship Building Co. also closed a contract with J. W. Norcross & Co., Toronto, for a package freighter of Canadian canal size, being 257 ft. over all, 42½ ft. beam and 26½ ft. deep, equipped with triple expansion engines, 18, 29 and 48 in. diameters by 36-in. stroke, supplied with steam from two Scotch boilers, 13 ft. in diameter and 11½ ft. long, fitted with Ellis & Eaves draft and allowed 180 lb. pressure. She will be fitted with booms and hoisting engines for handling cargo both from deck and hold. She will be built at the yard of the Western Dry Dock & Ship Building Co., Port Arthur.

Mr. Norcross is also having built at the yard of the Clyde Ship Building & Engineering Co., Port Glasgow, Scotland, a package freighter to be equipped with Diesel engines. In this connection it is interesting to note that President Wallace of the American Ship Building Co. is also figuring on a package freighter to be equipped with Diesel engines.

The Graham & Morton Transportation Co., Chicago, has given contract to the American Ship Building Co. for a passenger steamer to be about 300 ft. long and to have about 200 staterooms. She will be built at the Cleveland yard of the American Ship Building Co. and when launched will be christened City of Grand Rapids. She was promised for delivery on June 15 next.

The keel of the new bulk freighter to be built for Boland & Cornelius, of Buffalo, was laid at the Ashtabula yard of the Great Lakes Engineering Works, on Nov. 2. This vessel and the duplicate of the Col. James M. Schoonmaker under construction at the Ecorse yard of the Great Lakes Engineering Works are the only two bulk freighters ordered for 1912 delivery.

The Standard Oil Co. has given contract to the American Ship Building Co. for an oil carrier to be 380 ft. keel, 52 ft. beam and 28 ft. deep. She will be built at the Lorain yard on the Isherwood system. This makes the eighth vessel that the American Ship Building Co. has built for the Standard Oil Co. during the present year.

Iron Ore Shipments

Ore shipments during October were 4,769,965 gross tons as against 4,877,441 gross tons for the corresponding month last year, a decrease of 107,476 tons. The movement to Nov. 1 is 29,607,102 gross tons as against 39,978,308 tons to Nov. 1, 1910, a decrease of 10,371,206 tons. During November last year 2,641,886 tons were moved and if the fleet moves an equivalent amount this year the total movement for the year will be 32,248,988 tons. It is not expected, however, that the November movement this year will equal that of last year. To begin with all the shippers are through with outside tonnage. The Pittsburgh Steamship Co. has retired its barges and it expects to ship its last cargo of ore on Nov. 18. The clean-up will be early and it is doubtful if over 2,000,000 tons will be moved during the

month. The total shipments for the season will therefore be somewhat between 31,000,000 and 32,000,000 tons. The summary follows:

Port.	Oct. 1910.	Oct. 1911.
Escanaba	639,444	677,807
Marquette	309,283	387,436
Ashland	380,839	381,595
Superior	1,317,902	1,368,893
Duluth	1,223,710	956,342
Two Harbors	1,006,263	997,892
Total	4,877,441	4,769,965
1911 decrease		107,476

Port.	To Nov. 1, 1910.	To Nov. 1, 1911.
Escanaba	4,507,517	3,764,654
Marquette	2,998,503	1,956,147
Ashland	3,817,669	2,260,381
Superior	7,802,254	9,315,002
Duluth	13,089,262	6,457,706
Two Harbors	7,763,103	5,853,212
Total	39,978,308	29,607,102
1911 decrease		10,371,206

Receipts by Ports.

Out of a total movement of 4,769,965 tons of ore during October, 4,009,062 tons came to Lake Erie ports, distributed as follows:

Port.	Tons.
Buffalo	325,388
Erie	45,702
Conneaut	1,169,759
Ashtabula	1,069,315
Fairport	48,444
Cleveland	685,549
Lorain	484,187
Huron	28,648
Sandusky	....
Toledo	104,275
Detroit	47,795
Total	4,009,062

Decided Revival in Ship Building

Anticipating the opening of the Panama canal, American coastwise companies are adding to their tonnage or are contemplating doing so. The American-Hawaiian Stemship Co., of New York, has given contracts to the Maryland Steel Co., Sparrows Point, Md., for five freighters to be built on the Isherwood system and to be 415 ft. long, 53 ft. 6 in. beam and 31 ft. 6 in. deep. It is the expectation of the company to place additional orders later.

The New York Ship Building Co., Camden, N. J., is building oil tankers for the Standard Oil Co. to be 330 ft. long, 46 ft. beam and 27 ft. deep, as well as an oil tanker on the Isherwood system for the Huasteca Petroleum Co., Los Angeles, Cal., to be 392 ft. long, 51 ft. beam and 30 ft. deep.

The Baltimore & Carolina Steamship Co. has given contract to the Harlan & Hollingsworth Corporation, Wilmington, Del., for a freighter 230 ft. long, 39 ft. beam and 20 ft. deep.

Specifications have been sent to the shipyards by E. J. Luckenbach, of New York, for a cargo boat on the Isherwood system to be 395 ft. long, 52 ft. beam and 37 ft. 6 in. deep. It is reported that Mr. Luckenbach may follow this order with two others.

The Clyde-Mallory Line is also asking bids on two passenger and freight steamers to be about 390 ft. long. A. H. Bull & Co., of New York, will build two freighters on the Isherwood system. Lake shipyards have been invited to tender for these two boats, although alternate bids are also being asked, and it may be that the vessels as eventually built will be too large to go through the Canadian canals.

The New York & Porto Rico Steamship Co. is asking bids for the construction of a passenger and freight boat to be 420 ft. long, 54 ft. beam and 37 feet deep. The Alaska Steamship Co., of Seattle, is in the market for a freight and passenger steamer to be 350 ft. long, 50 ft. beam and 38 ft. deep.

The Great Lakes Engineering Works, Detroit, recently launched the steamer Graysom for the Ocean Freight Line, Inc., 32 Broadway, New York, and expects in a few days to launch a companion ship to be known as the Borinquen. The third vessel, the Pomperang, is also well under way, and contract was recently secured for a fourth steamer for this fleet. The Ocean Freight Line, Inc., is a new company and intends to engage in trade with Porto Rico.

Local Inspectors Reversed

An appeal was taken against the decision of the local inspectors of Detroit in suspending the license of Capt. Townsend of the Clement in the Clement-Fisher collision case by Goulder, Day, White & Gary, with the result that Supervising Inspector C. H. Westcott reversed their decision in the following letter:

"In reply to your appeal of the 2d instant, as attorneys for Henry H. Townsend, from the decision of the local inspectors at Detroit, in suspending his license as master and first-class pilot for 30 days for violation of rules 1, 2, 3 and 5 of the pilot rules for the great lakes, and rule 17 of the laws relating to the navigation of vessels on the great lakes and their tributaries, you are advised that, after a careful consideration of the testimony adduced at the trial, I I am unable to agree in full with the conclusions reached by the local inspectors, and even though I could agree with them as to their findings in the case, I would then be constrained to revoke their decision, as I am firmly of the opinion and belief that Captain Townsend has been fully and sufficiently disciplined through the investigation and trial of the case, covering a period of nearly six months—a much longer time than this office approves of, or believes is necessary to conclude cases such as this—a portion of which time Captain Townsend has practically been under suspension, being called from his vessel on three occasions, viz.: July 24, Sept. 16 and Oct. 6, 1911, during the trial and investigation of the case, necessitating the placing of another master in his place, at a loss of time and compensation to him, as I am informed.

"This office does, therefore, for the above stated reasons, under the authority of section 4452 R. S. U. S., revoke the decision of the local inspectors in the suspending the license of Captain Townsend."

New Chief of Revenue Cutter Service

Capt. Elsworth Price Berthorff has been appointed chief of the revenue cutter service to succeed Capt. Worth G. Ross, who has voluntarily retired owing to ill health. Capt. Berthorff was born on April 7, 1866, in New York City. He entered the school of

CAPT. BERTHORFF, THE NEW CHIEF OF THE UNITED STATES REVENUE CUTTER SERVICE

instruction of the revenue cutter service in 1885 as a cadet and was commissioned third lieutenant in 1889, second lieutenant in 1892, first lieutenant in 1900 and captain in 1907. When he received his appointment as commandant he was in command of the revenue cutter Morrill, stationed at Detroit. In 1897 he led the overland expedition to the relief of a fleet of eight whaling vessels which were ice-bound near Point Barrow, Arctic ocean. This expedition was led with

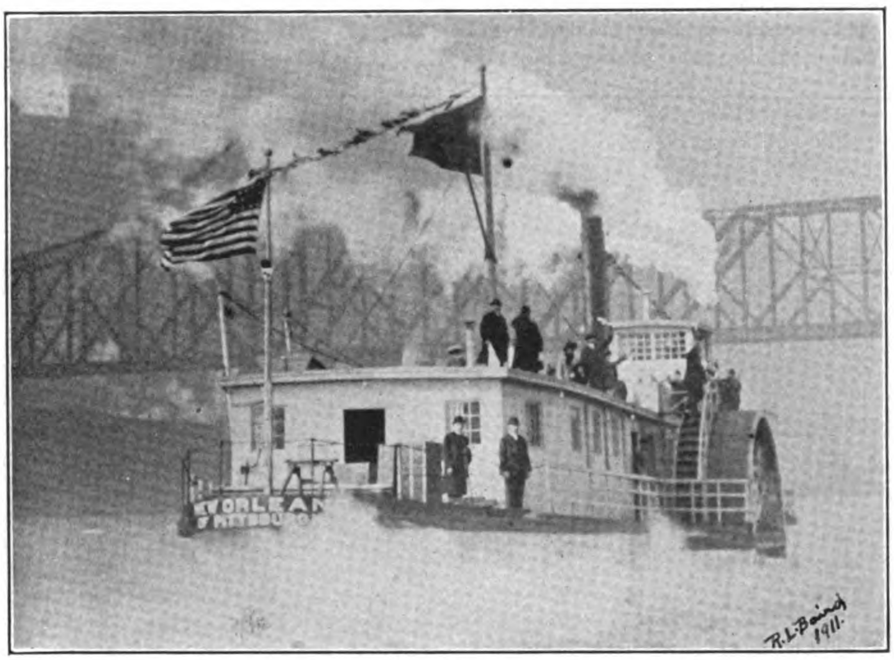
remarkable courage and dispatch and was entirely successful. Congress awarded him a gold metal for his conduct during this expedition. Capt. Berthorff has been altogether 19 years at sea.

Centennial of Steam Navigation on Western Rivers

THE centennial of steam navigation on the western rivers was celebrated at Pittsburgh, on Oct. 30, 31 and Nov. 1 and 2, under the auspices of the Historical Society of Western Pennsylvania. The celebration on Monday was devoted to addresses in the lecture hall of Carnegie library in the afternoon and at Carnegie Music Hall in the evening. At the evening meeting addresses were made by Governor John K. Tener, Mayor Wm. A. Magee, Congressman Nicholas Longworth, Congressman John Dalzell, Dr. C. S. Bullock and Col. John L. Vance, president of the Ohio Valley Improvement Association. Wm. H. Stevenson, president of the Historical Society of Western Pennsylvania, presided.

The general tenor of all the speeches was the development of the Ohio river to the Mississippi, epitomized in the following excerpt from Mr. Longworth's address:

"We can look comfortably forward to the time, not more than ten years hence, when the Ohio river will be a great lock canal never less than 9 ft. deep from the conjunction of the Allegheny and Monongahela rivers to the point nearly 1,000 miles away where it meets with the waters of the Mississippi, a canal upon which the commerce of one of the richest and most popular sections of the nation will be transported in all seasons of the year. Then the Ohio river will be what it once was, but to a degree never dreamed of then—the great commercial highway of the middle west—and not only that, but one of the great commercial arteries of the world. This government is engaged upon two gigantic engineering projects which overshadow all others; first, the canal at Panama, and second, the canalization of the Ohio river."



THE REPLICA OF THE NEW ORLEANS ON HER WAY TO THE GULF

On Tuesday, Oct. 30, Mrs. Alice Roosevelt Longworth christened a replica of the New Orleans, the first steam vessel to navigate the western rivers. President Taft attended the ceremony. All the river craft available had been assembled between the Smithfield street and Wabash railroad bridges, each gayly decorated. Moreover, the adjoining banks were literally packed with people and President Taft remarked that it was the largest gathering that he had seen during his present tour. The president made a brief talk, saying that Pittsburg needed a 9-ft. stage of slack water to Cairo and promised that it would be accomplished within five years. The afternoon was given over to the parade of steam vessels and in the evening the president attended the banquet in Memorial hall, given in his honor by the Pittsburgh Chamber of Commerce. The extempore remarks that the president felt called upon to make at this banquet were entirely aside from the purpose of the celebration.

Wednesday was given over to reading of papers largely of a historical character. Professor James M. Callahan, of the University of West Virginia, read a paper on "The Wheeling Bridge Case and Pittsburgh and Wheeling Rivalry for Headship on the Ohio River." This paper was of an historical character and dealt with the fight to prevent the B. & O. railroad from bridging the Ohio. The fight appears to have been very bitter and involved three states, being finally settled by congress itself.

Richard T. Wiley, Elizabeth, Pa., read a paper on "Early Bridge and Ship Building on the Ohio River and Its Tributaries". He brought out the fact that in the early days vessels traversed this waterway laden with materials for many ports of the world. The earliest record of ship building was in 1792, when ships were built for ocean-going service.

At the afternoon meeting in Carnegie Library Lecture hall, Dr. Reuben Gold Thwaite, of Wisconsin, read a paper on "What a Historical Building Should Mean to Pittsburgh". His point was that when an immigrant comes to America he hears no allusion to national annals. They are only meagerly taught in the schools and the immigrant naturally concludes that the American states and cities have no history worth knowing. He thought that they could be made better citizens if they could be made acquainted with the history of the country and its ideals. Dr. Thwaite pointed out many channels through which the Historical Society could work, such as giving lectures, collecting archives, prosecuting research, holding pilgrimages and commemorative affairs and in brief cultivating an historical consciousness. Dr. Clarence S. Brigham, librarian of the American Antiquarian Society of Worcester, Mass., spoke along the same general lines. Dr. Carl Russell Fish, of the University of Wisconsin, spoke on New England's relationship to the Ohio Valley.

At the evening meeting addresses were made by Dr. James Alton James, president of the Northwestern

University of Chicago, on "Pittsburgh—Key of the Revolutionary War in the West". Honorable Albert Bettinger, of Cincinnati, read a paper on "The Ohio River and the Future of American Inland Navigation".

Professor H. H. Hulbert delivered a paper on "America and the Problems of the Pacific".

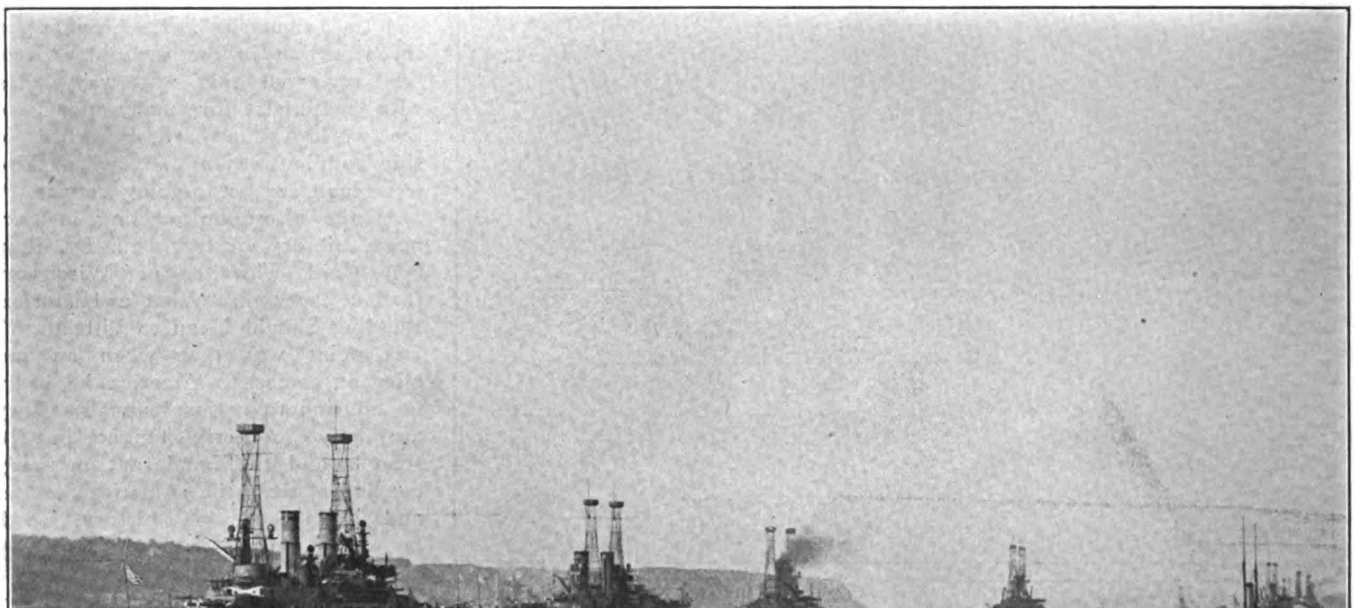
On Thursday, the replica of the steamer New Orleans left on its journey to the gulf.

The Atlantic Fleet in Review

FROM every standard of comparison the most notable fleet ever assembled by the United States was that reviewed by President Taft and Secretary of the Navy Meyer, at New York, Nov. 2. It involved the greatest number of American vessels ever mobilized, with the greatest total displacement and represented the maximum in fighting effectiveness probably ever gathered at one point by any nation.

As indicating something of the increased strength of our navy it is interesting to contrast the number of vessels and their total displacement, which took part in the other important naval reviews of recent years. In the international naval review at New York in March, 1893, there were fourteen American naval vessels of all classes with an aggregate displacement of 39,436 tons. President Roosevelt, in September, 1906, reviewed, at Oyster Bay, the Atlantic fleet then comprising forty-five vessels displacing 279,612 tons. During the Jamestown exposition there was mobilized at Hampton Roads in June, 1907, a fleet of thirty-three vessels displacing 285,251 tons. When the Atlantic and Pacific fleets met at San Francisco in May, 1908, they combined a total of forty-six vessels displacing 407,927 tons and in September, 1909, at the Hudson-Fulton celebration forty-three vessels were assembled with a total displacement of 316,762 tons. This latest review at New York included 102 vessels of all classes displacing about 577,285 tons, which does not include the eight submarines of which no figures were available. Concurrently at Los Angeles a review was taking place of twenty-four vessels of 116,000 tons displacement, giving a grand total of 126 vessels displacing 694,000 tons. Perhaps the most striking evidence of our progress is that of all the vessels in the New York review the only ones that were a part of our navy at the time of the Spanish war were the battleships Iowa, Indiana and Massachusetts, the gun boats Castine, Nashville, Marietta and Petrel, a few of the small torpedo boats and some of the fleet auxiliaries.

The following table shows the



THE BATTLESHIP FLEET ON THE HUDSON RIVER

Photo by Underwood and Underwood

number of vessels of each class in the Atlantic fleet and their total displacement:

	Tons.
24 Battleships	366,864
2 Armored cruisers	29,000
2 Cruisers	6,950
22 Destroyers	15,463
16 Torpedo boats	2,994
8 Submarines	....
3 Tenders to torpedo fleet	8,466
4 Gunboats	4,737
9 Miscellaneous	40,733
8 Colliers	93,938
1 Oil tanker	6,159
3 Tugs	1,981
102 Vessels of all classes	577,285

Exclusive again of the submarines these vessels represent a total horsepower of 946,811, for the supplying of which there are 567 boilers with an aggregate of 46,360 sq. ft. of grate surface and 2,062,000 sq. ft. of heating surface. All of the battleships, cruisers and topedo boats except the battleship Iowa have water tube boilers. This is an interesting reversal of the condition of affairs at the time of the Spanish-American war, when outside of the torpedo boats there were only four warships then equipped with water tube boilers. Seventeen of the destroyers burn oil as fuel and the four latest battleships Delaware, North Dakota, Utah and Florida burn oil in conjunction with coal. The fleet has attached to it a fuel oil tank ship to carry the reserve fuel oil supply for these vessels, serving the corresponding functions of the eight colliers carrying the coal supplies for the other vessels.

The aggregate coal bunker capacity of the fleet is 81,450 tons. Adding to this the coal cargo capacity of the colliers, 58,813 tons, the fleet can sail away with a total of 140,263 tons of coal. Propelled simultaneously at their full power all of the vessels would consume coal at the rate of 20,000 tons a day.

The government has invested in this fleet $123,397,400, to say nothing of the cost of supplies of all kinds and the salaries of the officers and crew.

With its full complement the fleet would carry 27,344 men and 1,660 officers, a total of 29,004, and it is safe to say the actual figure is in the neighborhood of 25,000 men.

The average speed of the vessels is 21.6 knots. The fastest vessel is the destroyer Paulding, which is capable of a speed of 32.8 knots. Placed end to end touching, the vessels of the fleet would extend a total length of 29,942 ft. or over 5 2-3 miles. If passed in review in single file at an average distance apart of 300 yds. the fleet would form a line extending nearly 23 miles and at an average speed of 10 knots an hour would take about 2 hours to pass a given point.

The armament of the fleet includes 181 torpedo tubes and 1,590 guns of all kinds. The battleships, armored cruisers and scouts have either two or four submerged torpedo tubes discharging 21-inch torpedoes and their battle equipment of four torpedoes for each tube would make a total of 300 torpedoes, each carrying 200 lb. of gun cotton. The torpedo boats each have two or three 18-in. tubes and in time of war would carry all told about 200 torpedoes. A single broadside of torpedoes from the vessels in line would carry a total of 35,000 lb. of gun cotton. Of guns from 6 to 13 in. caliber there are 496, one round from which would discharge a total weight of 182,800 lb. and require 62,650 lb. of powder. In the projectiles would be carried about 7,000 lb. of high explosives. The range of the largest of these guns is 12 miles and it is interesting to note that at the recent target practice from which many of these vessels have just come, remarkable accuracy of fire was shown at ranges of from 15,000 to 16,000 yds. The remainder of the guns in the fleet ranging in caliber from 1 to 5 in. discharge projectiles ranging in weight from 1 to 60 lbs.

It is self evident what such a fleet as this means to the shipbuilding and ordnance manufacturing industries, but there are also less intimately associated industries that played an important part in the equipment of this fleet. We are advised for example by the Blake & Knowles Steam Pump Works, 115 Broadway, New York City, that it has installed pumping equipment on 65 of these vessels which is a large percentage considering that nine of the remainder carry no steam pumps, including the submarines and one sailing vessel, and that eight of the others, principally colliers, were built abroad. The number of pumps this company has installed on the fleet exceeds 1,000 and their cost represents nearly $1,250,000.

To Upbuild Our Merchant Marine

A permanent national organization to advocate the improvement of the ocean mail service and the upbuilding of an American merchant marine was formed at a special meeting of the merchant marine committee of one hundred, held at the Waldorf Astoria, New York City, Nov. 2. The new organization expects to project the work along broad lines and will aggressively carry to the American people the patriotic policies for which it stands. John H. Hanan, the shoe manufacturer, was elected president of the new organization, C. D. Durkee, treasurer, and Jas. L. Ewell, secretary. At the meeting the following resolution was adopted:

"Resolved, That we, in meeting assembled, form a permanent National Merchant Marine Association, whose objects shall be: To promote, encourage, restore and advance the supremacy of the flag of the United States of America upon the merchant shipping of the world, and to provide proper inducements, encouragement and protections to users and owners of vessels built in our country, to promote American commercial interests throughout the world and to encourage, aid, assist and pursue through all proper methods for the establishment and maintenance of an American merchant marine, and to reform abuses and acts detrimental to the same; to promote and better export relations; to promote and encourage the development of maintenance of suitable waterways, and terminal and dock facilities for the passage, reception and handling of vessels; to take active part in formulating laws affecting the aforesaid objects and to secure favorable legislation therefor; to provide lectures, addresses, meetings, conferences and literature for furthering the objects of the association; to secure the aid of the congress of the United States of America, state legislatures, boards of trade, chambers of commerce, industrial organizations, civic bodies, individuals and other channels for the advancement and accomplishment of the objects of the association; and to do any and all things for the good and welfare of the association and its members, and the carrying out of the object herein and hereby contemplated, not contrary to law."

The directors are as follows: John H. Hanan; C. D. Durkee; J. L. Ewell; Chas. F. Wiebusch; John H. Fisher; J. F. Coffin; Geo. W. Gittins; Geo. R. Burrows; H. C. Laudenbaugh; Andrew J. McIntosh; Fred A. Wuzbach and E. C. Bennett.

The first meeting of the new organization will be held late in January.

Barge No. 122, building for the Standard Oil Co., was launched at the Lorain yard of the American Ship Building Co., on Oct. 26.

VESSEL ACCIDENTS DURING OCTOBER

October had a fair proportion of accidents, due largely to heavy weather prevailing. The steamer A. D. Hayward was driven ashore at White Rock Reef, Lake Huron, and was badly pounded. The steamer D. Leuty, of Cleveland, went ashore in a snow storm at Lighthouse point near Marquette and hit the rocks pretty hard.

The lumber schooners also suffered, the Naiad being waterlogged in Saginaw Bay, and the Azov in Lake Huron. The steamer Odanah was thrown against the breakwater while trying to make Two Harbors and was laid up for several days.

An unloading rig fell on the steamer J. S. Ashley at the Inland Steel Co.'s plant at Indiana Harbor, caused by the collapse of a portion of the dock. Fortunately she was not seriously damaged. The Conemaugh collided with the Alfred Mitchell in Blackwell canal, Buffalo, and was slightly damaged.

The bulk freighter Emperor, the largest Canadian steamer on the lakes, was sunk in a singular manner at the lower entrance to the Canadian lock at the Sault, on Oct. 17, blocking the channel temporarily. The Emperor was bound from Fort William to Midland, with 310,000 bushels of wheat. The usual practice at the Canadian lock is to flood the vessels out, thus giving them the advantage of a few more inches of draught than is obtainable at the American lock, where the practice of flooding is not followed. It is customary for a steamer leaving the lock to give a sharp blast indicating to the canal crew that she is ready for the flood. Capt. George Pearson of the Emperor says that in this case the flood was forced and the gates opened before the steamer cast off her lines. She rushed out of the canal at high speed and the mate dropped an anchor overboard in order to check her. There is not sufficient water at the point, however, for a steamer to override her anchor, with the result that it tore a hole in her bottom and caused her to sink about 400 ft. from the lower approach to the lock with her stern against the north pier and her bow 100 ft. out in the channel. She was lightered and raised.

Following is the list of accidents:

Date.	Name of Vessel.	Nature of Accident.	Location.
Oct. 5	Str. Wyoming	Ran aground; tug sent to her assistance	Middle Ground, St. Clair River
Oct. 5	Bge. No. 96	Cable parted between barge and Str. Security which towed her...	
....	Str. Georgetown	Ran aground	Ogdensburg Harbor.
Oct. 6	Str. Corunna	Ran ashore; abandoned to underwriters as constructive total loss; released Oct. 8 and taken to Port Arthur where she will be docked; wreckers' bill, $10,000; owners withdrew abandonment.	Welcome Island, Thunder Bay.
....	Str. Missouri	Ran ashore	Biddle Point, near Mackinac Island.
Oct. 6	Str. Roumania	While tied up at Gas Co.'s dock was hit by Str. Arizona on port quarter; damage estimated at $1,000; will be repaired at Cleveland	Racine, Wis.
Oct. 6	Sch. Quickstep	Ran on beach; crew taken off	Glen Arbor, Mich.
Oct. 6	Tug Alva B.	Hit by Central avenue bridge, damaging stack and whistle pipe..	Cleveland, O.
Oct. 6	Str. A. D. Hayward	Driven ashore in heavy weather and pounded hard; brought to Port Huron Oct. 11 by wreckers who released her	White Rock Reef, Lake Huron.
....	Str. Hamonic	Hit Northern Pacific dock and damaged number of plates	Duluth, Minn.
....	Str. John A. Donaldson	Ran aground in dense fog; released	Mud Lake.
Oct. 12	Str. C. R. Van Hise	While entering lock broke her steering engine; delayed three days making repairs at Sault Ste. Marie, Mich	Sault canal.
Oct. 13	Str. Masaba	Hit an obstruction in fog, damaging her bottom; repaired at Port Huron	Abreast of Sandwich, Detroit river.
....	Str. James Corrigan	Steering gear disabled; stopped at Reid's dry dock, Port Huron, on Oct. 14 to make repairs	————
Oct. 13	Car Ferry Ann Arbor 4	Stranded	Rock Island, Lake Michigan.
Oct. 14	Str. Wilkesbarre	Collided with lightship Kewaunee stationed to mark Joliet wreck; considerable damage done	St. Clair river.
....	Str. D. Leuty	Broke crank-pin and broke down; towed to Houghton for repairs.	Lake Superior.
Oct. 15	Bge. W. K. Moore	Collided with lightship Kewaunee stationed at wreck of steamer Joliet, doing considerable damage. Moore lay across bow of Joliet and tugs had to be sent to her assistance	St. Clair river.
Oct. 15	Str. Ericsson	Ran aground on Canadian side in fog and barge Fritz, which she towed, crashed into her stern and stove it in about 3 ft.; released herself and stopped at Sault, leaving there on Oct. 17 for Lorain, where she was docked for repairs	Opposite Sailors' Encampment, St. Mary's river.
Oct. 15	Bge. Fritz	Hole in her bow a few feet above water line as result of above accident; temporary repairs made at Sault and then went to Toledo, where she will be repaired and will lay up for the winter.	Opposite Sailors' Encampment, St. Mary's river.
Oct. 17	Str. Emperor	Flooded out of Canadian canal and in dropping anchor to check her, it tore large hole in her bottom, causing steamer to settle on bottom about 100 ft. from lower approach; moved out of channel after lightering part of cargo on Oct. 18; temporarily repaired; will be docked later	Lower entrance to Canadian lock, Soo.
Oct. 17	Str. R. W. E. Bunsen	Ran ashore in fog; released on Oct. 18 by wrecker Favorite; not damaged	Point Aux Barques, Lake Huron.
Oct. 17	Bge. Jenney	In tow of steamer Bunsen; docked at Lorain for repairs	Point Aux Barques, Lake Huron.
Oct. 17	Str. Midland King	Ran aground; released herself on Oct. 18	Ballard's Reef, Detroit river.
Oct. 18	Str. Arundell	Burned to water's edge as she was laying up for winter; cause unknown; total loss	Douglass, Mich.
Oct. 18	Str. Briton	Got chain in her wheel; detained a day while diver extricated chain	Hay lake.
Oct. 18	Str. Robert Mills	Ran aground	Off Grosse Point, Lake Michigan.
Oct. 21	Str. Willis L. King	Ran into Great Northern ore dock; steamer not seriously damaged but about 150 ft. of fender to the dock carried away; damage estimated at $2,000	Allouez Bay.
....	Str. John Dunn Jr.	Broke her steering gear; tug sent to her and towed her to Toledo where she was repaired	Near Southeast Shoal, Lake Erie.

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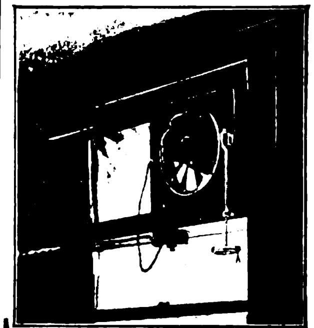

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Oct. 22	Sch. Naiad	Became waterlogged in heavy gale and was abandoned by her crew who were taken off by steamer Cornell; picked up and towed to Harbor Beach on Oct. 24	Saginaw bay.
Oct. 22	Sch. Azov	Waterlogged and capsized with load of lumber; sprang a leak in heavy weather; abandoned by crew; driven ashore above Port Clark on Canadian side	Off Point Aux Barques, Lake Huron.
Oct. 24	Str. J. S. Ashley	Big unloading rig fell on her deck when dock at which she was unloading collapsed; one plate and hatch cover damaged, which were repaired	Indiana Harbor, Ind.
....	Str. W. J. Carter	Picked up in disabled condition by wrecker Favorite and towed to Port Huron; shaft broke	Off Port Sanilac, Lake Huron.
Oct. 28	Str. Buffington	While backing out from dock cable got in her propeller; diver employed to disentangle same	Two Harbors, Minn.
Oct. 28	Str. Odanah	While making port in heavy sea struck east end of breakwater, damaging rudder; towed to Superior on Oct. 29 for repairs and was docked; will have to get new rudder and shoe; about ten days' time to make repairs	Two Harbors, Minn.
....	Str. Orion	Broke her shaft; picked up by lighthouse tender Hyacinth and towed into Manitowoc for repairs	———
Oct. 31	Str. D. Leuty	Ran on rocks in snow storm while trying to make Marquette harbor; crew taken off by life savers; badly pounded and finally broke in two near forward hatch; probably total loss	Lighthouse Point, near Marquette, Lake Superior.
Nov. 1	Tug Maxwell	While pulling on stranded steamer Leuty line parted and got in her wheel; towed to Marquette	Near Marquette, Lake Superior.
Nov. 1	Str. L. C. Hanna	Collided with Str. Michigan; hole stove in her bow and 17 plates will have to be taken off; damage above water line; to be repaired at Superior	Below Interstate bridge, Duluth.
Nov. 1	Str. Michigan	Collided with Str. L. C. Hanna; stem slightly bent, port anchor broken and three plates broken above main deck on each side	Below Interstate bridge, Duluth.
Nov. 1	Str. Sheldon Parks	Pounded severely in storm; two plates loosened	Lake Superior.
Nov. 1	Str. Harry Coulby	While being towed into port stern first hit east pier; three plates damaged; will be repaired after close of season	Lorain, O.
Nov. 1	Str. A. D. Hayward	Blown ashore while trying to make Harbor Beach for shelter in heavy gale; crew taken off; probably total loss	Near Harbor Beach, Lake Huron.
Nov 2	Bge. N. C. Holland	Hit wrecked steamer Joliet and considerably damaged; filled and towed into shallow water by tug Reid, where she sank	St. Clair river.
Nov 2	Str. North Star	Cargo slightly damaged by fire	———
....	Bge. Filer	Became waterlogged; lost deck load of lumber; abandoned by crew	———
Nov. 3	Str. Harvey H. Brown	Ran on a sand bar; will probably have to lighter part of cargo	Toledo, O.
Nov. 4	Str. Conemaugh	Collided with Str. Alfred Mitchell; five plates on starboard side near stern damaged and fender strake also slightly damaged; injuries estimated at $1,500; Mitchell not damaged	Blackwell canal, Buffalo.

October Lake Levels

The United States lake survey reports the stages of the great lakes for the month of October, 1911, as follows:

Lakes.	Feet above tide-water, New York.
Superior	602.23
Michigan-Huron	579.60
Erie	571.53
Ontario	244.62

Lake Superior is 0.03 feet higher than last month, 0.31 foot higher than a year ago, 0.64 foot below the average stage of October of the last ten years, 1.33 feet below the high stage of October, 1869, and 0.65 foot above the low stage of October, 1879. It will probably fall 0.2 foot during November.

Lakes Michigan-Huron are 0.03 foot lower than last month, 0.49 foot lower than a year ago, 1.14 feet below the average stage of October of the last ten years, 3.44 feet below the high stage of October, 1885, and 0.13 foot above the low stage of October, 1896. They will probably fall 0.3 foot during November.

Lake Erie is at the same level as last month, 0.35 foot lower than a year ago, 0.62 foot lower than the average stage of October of the last ten years, 2.17 feet below the high stage of October, 1885, and 0.73 foot above the low stage of October, 1895. It will probably fall 0.3 foot during November.

Lake Ontario is 0.29 foot lower than last month, 0.76 foot lower than a year ago, 1.25 feet lower than the average stage of October of the last ten years, 3.19 feet below the high stage of October, 1861, and 0.95 foot above the low stage of October, 1895. It will probably fall 0.3 foot during November.

OBITUARY.

William B. Kerr, superintendent of the Tonawanda Iron & Steel Co.'s furnaces at North Tonawanda, died at his home in that city, on Oct. 28. He received his training at the Isabella furnace of the Carnegie Steel Co. He was a stockholder in the Frontier Steamship Co.

An interesting feat in the casting of Monel metal was recently accomplished in the foundry of the Bayonne Casting Co., Bayonne, N. J., where a four-blade propeller wheel 16 ft. in diameter was cast in somewhat less than an hour. Fully 18,000 lbs. of the metal was required to allow for gates and finish, the melting temperature being about 2,500 Fahr. and the finished weight about 14,000 lbs. The wheel, because of its greater strength and freedom from corrosion, is to take the place of a steel wheel on the steamer Madison, of the Old Dominion Line.

H. M. S. Archer, the first of five destroyers of special type under construction for the British admiralty at the works of Messrs. Yarrow & Co., of Glasgow, was launched on Saturday, Oct. 21. The vessel is 240 ft. long by 25 ft. 7 in. beam, propelled by twin screws driven by turbines of the Brown-Curtis type constructed by Messrs. Yarrow. Steam is supplied by three Yarrow water tube boilers fired by oil fuel and fitted with a special form of superheater designed by the firm.

Arrangements have been made by the inspector of the eleventh lighthouse district to have the fog whistle at Fort Gratiot light station sounded whenever fog exists in the St. Clair river. Masters of down-bound vessels hearing the fog signal, even if the weather is clear on Lake Huron and at the entrance to the river will anchor outside the river or take such precautions as seen best.

The Hayward Co., 50 Church street, New York, has just issued pamphlet No. 576 descriptive of the drag scraper type of bucket. This bucket has stood many severe tests and can be used on practically all classes of operating machines with economy. The pamphlet contains many evidences of the efficiency of the bucket.